m&m ★ MARS,
INCORPORATED

ELIZABETHTOWN, PENNSYLVANIA 17022

J. Rutt
KarenE. Susan
Could we have any input?

TO	All Salaried Associates	DATE 6 September 1983
FROM	Computer Management Group	COPIES
SUBJECT	Information Systems Planning Project	

Beginning this month, the members of the Computer Management Group will be working to develop an Information Systems Plan for the Elizabethtown Plant. The purpose of the systems plan is to ensure that the plant's future operations will be properly supported by effective information processing.

Specifically the Systems plan will address the following questions:

° What information systems will be needed by Elizabethtown during the period covered by the plan and what is the most beneficial priority for developing these systems?

° What timetable should be adapted for developing the required systems?

° What is the broad class of hardware, software and communications facilities that would be necessary to support the plan?

° What manpower commitment would be necessary to implement the plan?

In accomplishing the above work, we will draw heavily upon the experience of each of you to insure that the systems plan is responsive to both the existing and future information needs of the plant.

The approach to this planning project involves the following major segments of work:

Document Business Objectives

In this segment, team members will review existing business objectives of the various departments and identify the key business factors which are critical to the company's success. These factors will be addressed when preparing the systems plan.

DP:XIV:ML.11

Information Systems Planning Project

Define Information Needs

The purpose of this segment will be to define the structure of information systems for the Elizabethtown Plant. Through interviews with each department, we will identify the business information needs required to effectively run the business and to support the achievement of our business objectives. The work done in this segment is perhaps the most important of all the tasks because the subsequent specification of systems projects will be based on the defined information needs and related systems features.

Determine the Present Status of Systems

This segment will involve determining where the company stands now with respect to the information requirements that have been defined. A determination will be made of how well the existing systems meet the requirements of the business. Existing systems will then be classified as satisfactory, in need of repair, or requiring replacement.

Develop the Systems Plan

This segment will involve developing the most effective approach for responding to the plant's systems requirements. The required systems development resources will be determined. The selection and priorities assigned to these projects will consider the plant's needs as well as its capacity for development. A timetable will be adopted for developing the required systems. The final step will be to incorporate the System plan into a report to management.

Within the next few weeks questionnaires will be distributed to each person who will participate in the interview process. This will provide everyone with time to evaluate the questions and research them if necessary prior to the interview sessions. The interviews will be conducted by CMG members for each of their respective sections.

We hope that you look forward to the opportunity to contribute to this project as it will serve as the framework for our systems development efforts at this plant.

DPXIV:ML.12

INTRODUCTION TO THE IBM-PC

COMPUTER LITERACY, WHAT DOES IT MEAN

Considering that everyone has heard or used the phrase "computer literacy" during the past several years, we should be clear about what that phrase means.

Computer Literacy is recognition of what a computer is and what a computer does. One who is computer literate has a basic understanding of the following:

* a brief historical overview of the computer

* the fundamental components of a computer system and the basic principles of the operation of a computer

* the basic standards of computer applications in such areas as word-processing, data base management, and electronic spreadsheets

* the role of computers in the overall management scheme of the company

In the material which follows, will introduce the topics described above using both written and hands-on activities.

PERXXII:JM.1

PROGRAMMING AND HARDWARE

Before we begin our study of microcomputer hardware, we need to define two very important terms: COMPUTER and COMPUTER PROGRAM.

A COMPUTER is a device which receives data or instructions, processes the data, and then performs the indicated task.

A COMPUTER PROGRAM is the set of instructions which the computer follows to allow it to do the task. The specific way in which these instructions are entered into the computer is determined by the LANGUAGE in which they are written. There are a number of different languages such as COBOL, PASCAL, and BASIC. The one which was used in the pre-course material was BASIC. We will use BASIC throughout the rest of the course as well. No matter what language a program is written in, it will have these qualities:

1- It is written in a very logical step by step manner.

2- The instructions must be very specific.

The following activity will help clarify both of these definitions.

PERXXII:JM.2

Input Devices

The microcomputer's "food for thought" is its data. As a stereo cannot produce music without the actual record, a computer cannot provide information of any kind without data. Because this information must be provided to the computer, it has been given the name input, which refers to any data or information that is put into the computer's memory.

The devices used to provide the computer with input are referred to as input devices. There are several such devices. The keyboard is the most obvious and immediate and the most frequently used. Each keystroke -- be it a letter, a numeric character, a punctuation symbol, a function key, or any other keystroke -- is a single piece of data being input into the computer memory.

The disk drive that transfers data stored on the diskette to the computer's memory is another frequently applied input device. The telephone modem that allows communication between two computer systems does so by providing input.

Output Devices

Returning to the analogy of the stereophonic music systems, we understand that the record album provides the system with the necessary input which is ultimately presented to the listener as musical tones. The sounds that the stereo produces are its output. Likewise, a computer returns information to the user. This information may be in the form of calculations, printed text, graphic displays, synthesized sounds, or other formats. This is the computer's output.

The most obvious output device on the microcomputer is its monitor (video screen, CRT). The monitor displays to the viewer the processed data that the computer has been instructed (programmed) to output. An equally familiar output device is the printer attached to a computer. Its function is obvious.
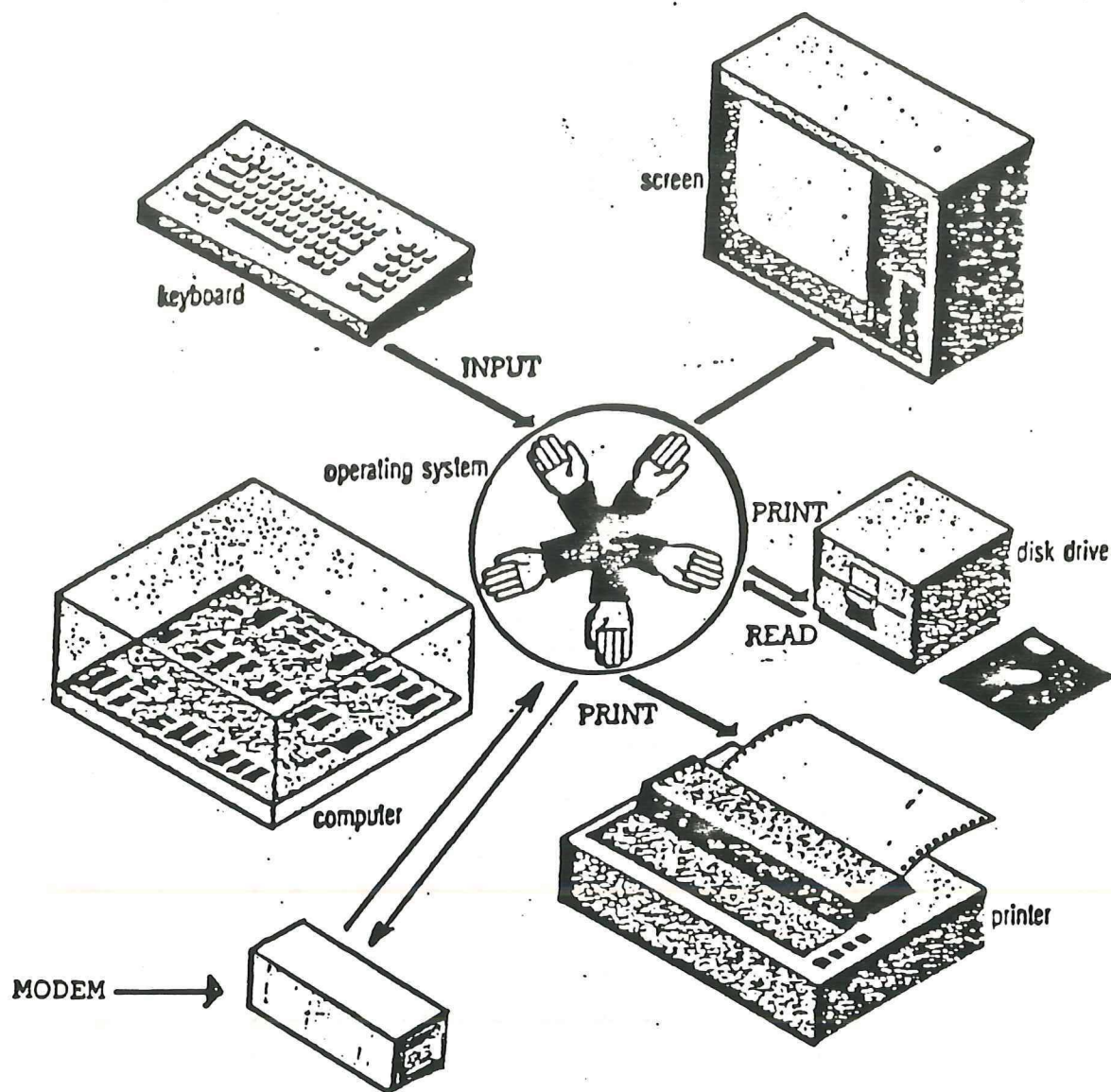
Many components of a computer system function as output devices as well as input devices. The disk drive is such, for it not only provides data to the computer from the storage disk but also transfers information that the computer has processed from the computer to the disk for storage. Because it serves both functions, the disk drive is commonly know as an input-output (or I/O) device. Another example of such is the modem. A modem both transmits and receives telephone/electronic signals from and to the computer to which it is connected. Thus it is both providing input and delivering output.

PERXXII:JM.3

The Computer of Central Processing Unit

The input received by the computer and the output provided to its monitor or printer or disk drive are not the same information. Between the reception of input and the transmission of output, the computer must perform some operation on that data. Whether that operation be arithmetic calculation, alphabetical sorting, transferring keyboard input to graphic display, or simply presenting the visual text that has been keyed in, the computer has to process the input before it can become output.

This processing is performed by the "brain" of the microcomputer, the Central Processing Unit. This is a microchip (larger than the others in the computer) that does three essential things: controls the functions of all parts of the computer system, performs arithmetic operations, performs logical operations. All data must pass through the CPU.
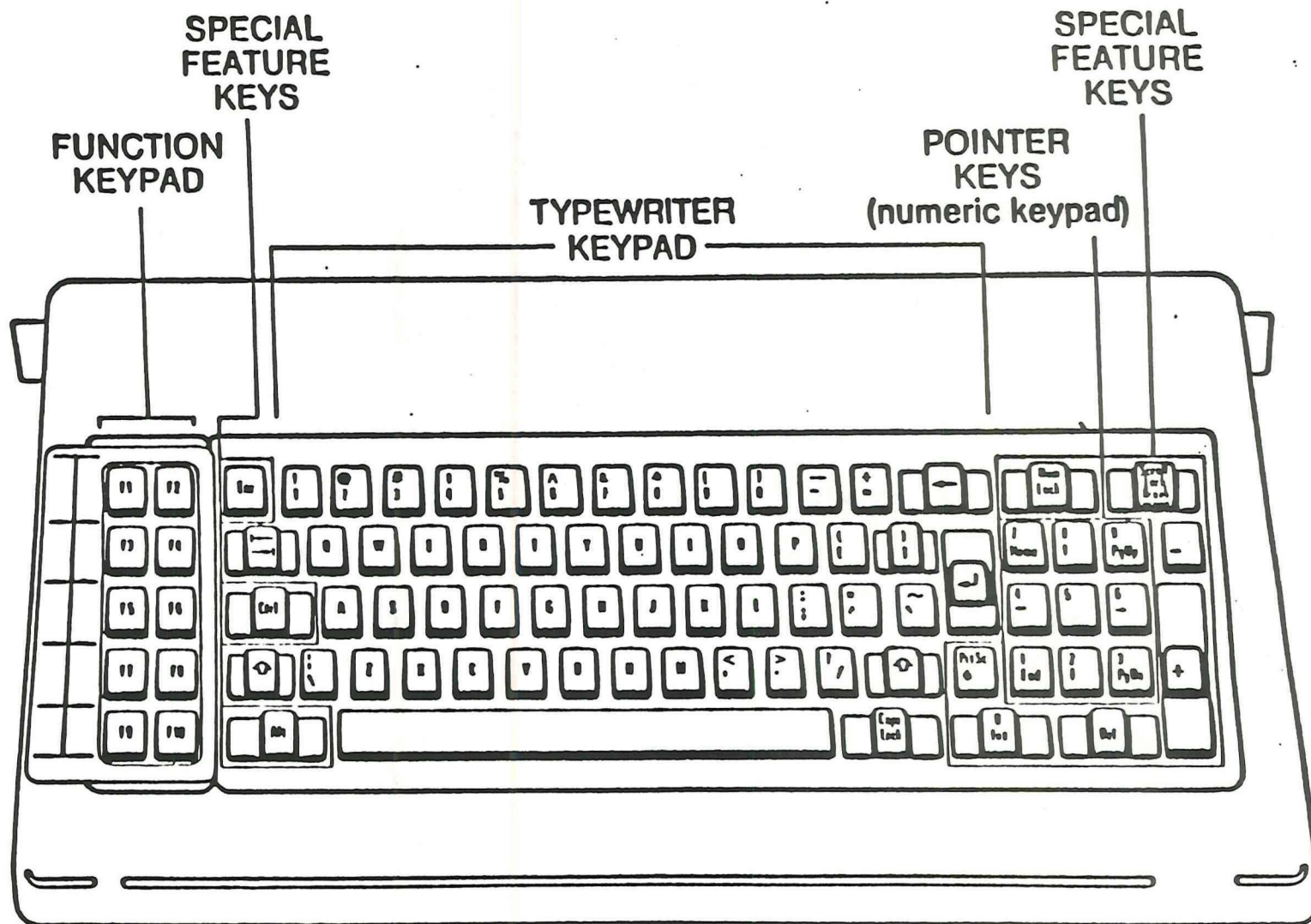
PERXXII:JM.4

keyboard

screen

INPUT

operating system

PRINT

disk drive

READ

computer

PRINT

MODEM

printer

SPECIAL FEATURE KEYS

SPECIAL FEATURE KEYS

FUNCTION KEYPAD

POINTER KEYS (numeric keypad)

TYPEWRITER KEYPAD

DIAGRAM OF KEYBOARD

ACTIVITY 1: KEYBOARD FAMILIARIZATION

First, you must "power up" your computer. Here's how:

Turn on the power switch on the right (rear) side.

Turn on the monitor and adjust contrast to suit you.

Here are a few very simple hands-on exercises to give you some practice with the keyboard.

1. Use the SHIFT KEY to type the following:

    I am pleased with the price of ELEC. SWITCHES: $10.75.

2. Press ENTER (<———').
    What happens to the cursor?

3. Toggle CAPS LOCK and retype the above line (#1).

4. Use the BACKSPACE KEY to erase $10.75 and enter $12.50.

5. Use the CURSOR CONTROL KEYS to move the cursor to pleased.

6. Press the INSERT KEY; notice the changes in the shape of the cursor. Type unhappy.

7. Press the DELETE KEY to delete pleased (to the right of the cursor).

8. Press END KEY to move cursor to end of text line.

9. Toggle NUM LOCK KEY and attempt to move the cursor to the word price.
    What happens?

10. Press NUM LOCK KEY a second time and move the cursor. What happens?

11. Press the CONTROL + HOME combination to clear the screen.

NOTES:

KEYBOARD DEFINITIONS

Regular Key Functions

ESC   clears the line that contains the the cursor from the monitor screen

| <--   TAB -- performs the tab function as on a typewriter. The tabs are
--->| preset for every 8 spaces.

CTRL   Control -- a key used only with other keys to perform specific commands
             or functions.

(shift)   changes lower case to upper case as on a typewriter

<--   Backspace -- moves the cursor to the left, erasing one character per
             keystroke

<--'   Enter -- moves the cursor to the beginning of the next line, as the
             carriage return on a typewriter

Function Keys:

F1   List -- displays the command lines of a program

F2   Run -- begins the execution of a program

F3   Load -- transfers a program from disk storage to the computer's
             RAM memory

F4   Save -- stores a program that is in RAM onto a diskette

F5   Cont -- causes a program to restart after interruption by Stop or
             Ctrl-Break

F6   LPT1 -- summons line printer and must follow another command

F7   TRON (trace on) -- causes line numbers of a program to be displayed
             as the program is executed

F8   TROFF (trace off) -- cancels TRON

F9   Key -- changes functions of other keys

F10   Screen -- returns computer from the graphics mode to the character
             (text) mode; turns off color

PERXXII:JM.6

Numeric Keypad:

Num Lock	Number Lock -- turns number keys (of numeric keypad) on/off
.	Decimal point when numeric keypad is activated
Del	Delete -- deletes character to right of cursor (when keypad is de-activated)

Key Functions when Numeric Keypad Is OFF:

0 Ins	Insert -- sets keyboard to insert mode; allows text to be inserted at cursor and moves existing text to the right
7 Home	Home -- moves cursor to top left of screen
8 (up arrow)	Moves cursor up one line
9 PgUp	Scrolls up one screenload of text
4 <—	Moves cursor left one character per keystroke
6 -->	Moves cursor right one character per keystroke
1 End	Moves cursor to last character of line
2 (down arrow)	Moves cursor down one line
3 PgDn	Scrolls down one screen load of text
Caps Lock	Locks characters into upper case; returns to lower case (as Shift Lock on typewriter)
PrtSc *	Asterisk. When pressed with Shift Key, causes all text on screen to be printed
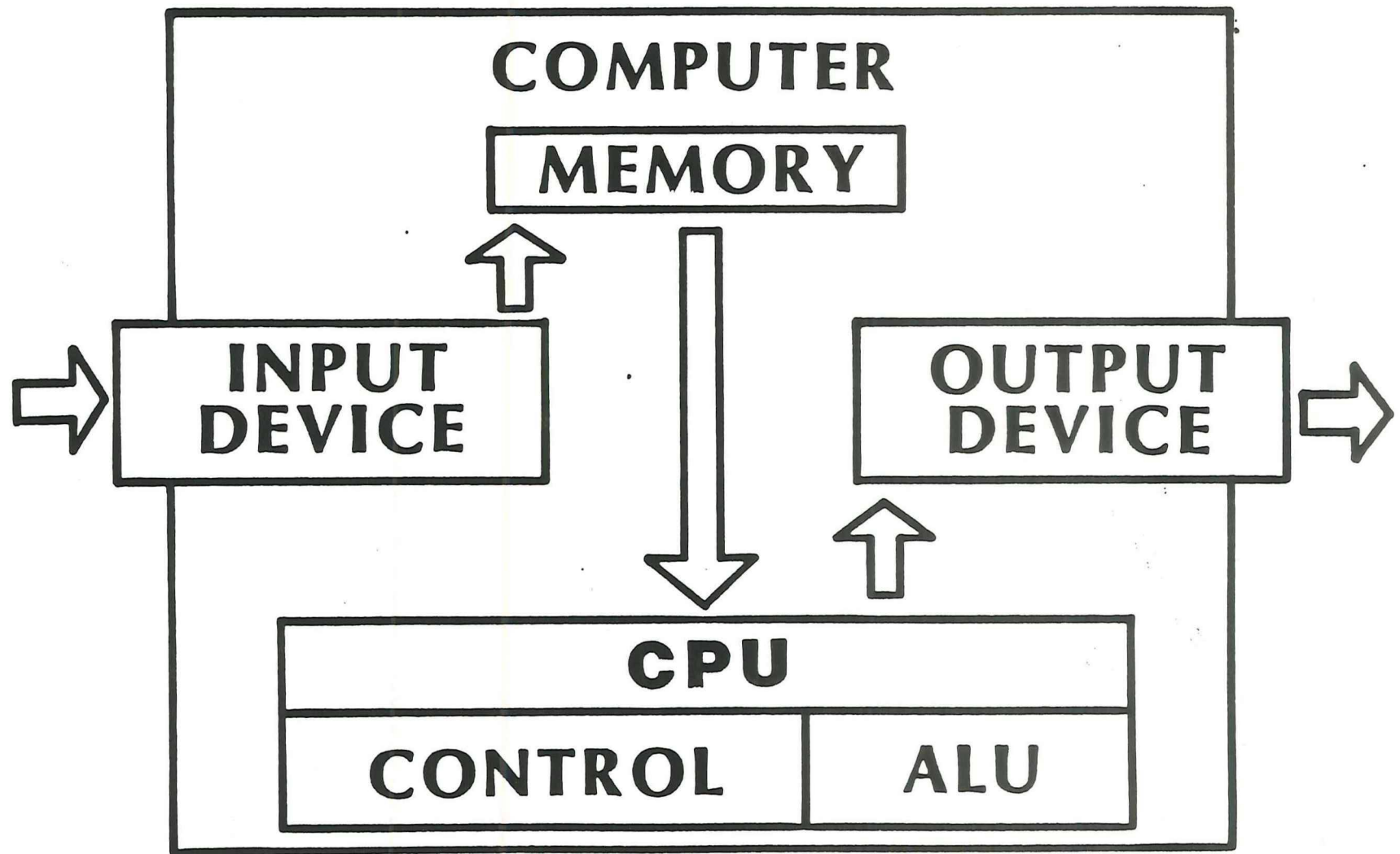
Control Functions

(represents the Ctrl key)

Scroll Lock = Break
        Interrupts program and displays line number where interrupted

Num Lock = Pause
        Stops program until any key is pressed to resume program

6/--> = Next Word
        Moves cursor to next word in line of text

4/<-- = Previous Word
        Moves cursor to previous word in line of text

Home = Clear Screen
        Clears all text from screen and moves cursor to top left corner

Alt + Del = System Reset
        Reloads system or program diskette. Identical to "booting" a disk
        with computer turned on

NOTES:

Insert & go to end of line past comma
c cursor

THE OPERATION OF A MICROCOMPUTER

The "Flow" of Information

As the three standard kinds of computer components indicate, data follows a direct path through a computer system: input — processing — output. This is typically referred to as "flow".

A computer is given information to work with (data) and instructions of what sort of work to do (program). This is input. This input is stored in the volatile (RAM) memory of the computer's motherboard. The central processing unit (CPU) has the responsibility for following the correct sequence of execution of the instructions and for performing the necessary operations to carry out those instructions. The computer product (output) is returned to the user by whichever of the several means was indicated in the program: by the printed hard copy, by video display, by synthesized sound.

PERXXII:JM.9

ACTIVITY 2: INFORMATION FLOW

The best way to see how information flows through the computer is to watch it occurring. As you do the next activity, be sure to identify the concepts of INPUT, PROCESS, AND OUTPUT. This activity builds on the one which was done in the previous material.

Objective: To write a computer program in the BASIC Language, demonstrating input, processing, and output.

First, you must power up your computer.

1- Now input the following program. Remember, to press the enter key after each line.

```
 5 CLS
10 PRINT "MY NAME IS"
20 PRINT
30 PRINT "BILL" (Why not insert your own name)
```

2- Now type RUN and <ENTER>.

3- Now type 40 GOTO 30 and <ENTER>.

4- To stop the program from running, press CTRL/BREAK.

5- Now type LIST to see the program as you wrote it. We are now going to make a few subtle changes and use the FUNCTION KEYS to make running programs an easier process.

6- Retype line 30 as follows:

```
30 PRINT "BILL",
```

7- Now run the program . BUT instead of typing run, use the appropriate function key. See the bottom of your screen.

8- Describe what happened: _Categorizes it into 5 different categories_

9- Now LIST the program. However, instead of typing, use the appropriate function key and press return.

10- Now retype line 30 once again. This time, use the following:

```
30 PRINT "BILL" ;
```

11- Describe what happens: _runs right into eachother_

F₁ - List
F₂ - Run.

(Control Break to stop)

PERXXII:JM.10   -13-

↵ (enter)   _Cursor must be at end of line . to enter_

Concerning Errors

Making a mistake when you are writing a program can be an unsettling experience. it helps to realize how friendly the microcomputer is and that it is not keeping a record of the number of mistakes made. The computer gives you an indication that a mistake has been made by printing an ERROR MESSAGE on the monitor. The most common message is SYNTAX ERROR which merely means that the command given is not in the computer's exact language. (Spelling errors and incorrect symbols account for the vast majority of syntax errors.)

First-time users typically cringe at those early errors. You need not worry, for all mistakes are correctable...most of them quite easily. Here are some hints for correcting errors.

1. When you see an error on the line you are presently typing, just backspace and retype. NOTHING IS ENTERED INTO THE COMPUTER MEMORY UNTIL THE ENTER KEY IS PRESSED.

2. If the ENTER key has already been pressed, the simplest means of correcting and error is to retype the entire line. Only the most recently typed version of a line matters, so you need not "erase" the version with the error.

3. In the event of serious mistakes you either cannot correct or discover, typing NEW will clear the entire program from the computer's memory and allow you to start anew.

4. As a last resort, turn off the computer then power up again and start all over. (CTRL + ALT + DEL will accomplish the same thing.) It is a good idea to remove any disks in the machine before you turn off the computer.

REMEMBER: MAKING MISTAKES IS A COMMON PART OF KEYING IN DATA OR PROGRAMS. WHEN YOU MAKE MISTAKES, YOU ARE NO DIFFERENT FROM THE REST OF US. JUST DON'T PANIC AND REMEMBER THAT MISTAKES CAN BE CORRECTED.

PERXXII:JM.11

ACTIVITY 3:   CORRECTING ERRORS AND REVISING PROGRAMS

Objective: To learn to correct errors and make revisions in a program.

1.   Insert the Basic Business disk in Drive A of the computer, and close the drive door.

2.   Press CTRL & ALT. While holding them down press the DEL key.

3.   At the Enter New Date: prompt, press the ENTER key and at the Enter New Time: prompt, press the ENTER key also.

4.   At the A> type BASICA (it can be in lower case) and <ENTER>.

5.   The screen now on your computer is the same as it was for your last activity.

6.   Press the CAPS LOCK key and type the following: LOAD "QUIZ

7.   After the OK type RUN and answer the four questions. NOTE: The program will only recognize 5 as the answer to How Many Cups in a Quart. Use this answer.

8.   We will use this program to demonstrate correcting errors and revision.

9.   Type LIST and <ENTER>. The program is now printed out for us on the screen. Our first task is to correct the incorrect answer for the last question.

10.   Move your cursor up to line 940 and over to the right to place it under the number 5. Type 4 instead. Press <ENTER> until the cursor is below the last program line.

11.   Type RUN and answer the question with the proper answer, 4.

12.   Lets revise the program by changing the first question.

13.   Type LIST and <ENTER>.

14.   Move the cursor to line 900 and press END.

15.   Now erase the line. You can either BACKSPACE or press the ESC key. The ESC key will erase the entire line.

16.   Type this new line:
      900 DATA WHAT FOOTBALL TEAM JUST MOVED TO NEW JERSEY, JETS and press <ENTER>.

17.   Move the cursor to the end of the program, type RUN and press <ENTER>. The new question is in the quiz.

The Disk Operating System (DOS)

SYSTEM SOFTWARE

Information stored on the disk can be of two types. The first type of data, the program, enables the computer to perform a particular task. Disks with program on them are what we call software.

The second type of data is the hard factual data used by the program. An example of this is the names stored for use in a mailing program.

Software programs are placed in one of two major categories. The first category is Operating System Software which enables the computer to perform necessary internal and disk functions. The second category is Applications Software. These are the programs which perform the specific tasks required on the computer by the user.

Operating Systems Software: As you are probably aware, you cannot run a program designed for an Apple Computer on your IBM. The reason for this incompatibility is the different operating systems found in each computer. The operating systems on computers must be identical if there is any hope of swapping software between the machines. The two primary operating systems found on microcomputers are MS DOS and CP/M. CP/M stands for CONTROL PROGRAM FOR MICROPROCESSORS and is written specifically for computers which use a Z80 microprocessor. MS DOS is the operating system used for the IBM and IBM compatible machines. In both cases there are a number of versions in use. Another operating system which is gaining in prominence is UNIX. This operating system was originally developed for a minicomputer, specifically the DEC PDP-7. This system allows the computers using it to be networked easily.

DOS is an acronym for Disk Operating System, which is a series of programs that are stored on a disk and that simplify operations of the computer system. DOS allows the transfer of data to and from the computer's main memory and stored memory, a diskette. Without DOS, retrieving a program or data saved on a disk and transferring it to the computer's memory would be impossible. Equally important is that information input to the computer's main memory cannot be transferred ("saved") to disk without the Disk Operating System.

ACTIVITY 4: BOOTING DOS

Objective: To learn to Load (Boot) the Disk Operating System into the computer.

Booting DOS

1. DOS may be booted in either of two ways.

    A. Cold Start
        Insert disk marked DOS into disk drive (the left if your computer has
        two drives) with the label facing up. Close the drive door.

        If your computer is turned off, turn it on. This is a "cold start" boot.

    B. Warm Start
        If your computer is turned on, insert the DOS disk into the drive, and
        then press CTRL and ALT simultaneously. Then while holding them down,
        press DEL. This is a "warm start" boot.

2. Not the prompt to enter the current date. You may enter the date in any of
    these formats:

                        06-06-84
                        6-6-84
                        06/06/84
                        6/6/84

    followed by <ENTER>, or the <ENTER> key may be pressed without any date
    being typed.

3. Note the prompt requesting the current time. Time may be entered in the
    standard hours:minutes:seconds. & hundredths of seconds format and followed
    by <ENTER>. Again, <ENTER> alone may be pressed and no time typed in. (It
    should be noted that time is to be entered in accordance with the 24 hour
    mode: 1 P.M. = 13).

4. Next to appear on the screen is the DOS prompt: A>. This prompt signifies
    two things: first, that DOS is in operation and that only DOS commands will
    be accepted by the computer; in other words, that all computer operations
    will involve the disk/disk drive in some way; and secondly, that drive A
    (the drive on the left) is the drive accessed by the computer.

5. Type DIR and <ENTER> to display the directory of files on the disk.

    The first column is the File Name. The second is the first column is the
    File Name. The second is the Extension, a three-character distinction bet-
    ween files with the same name. The third column displays the size of the
    file in number of bytes. The fourth indicates the date of entry if a date
    was entered when DOS was booted, otherwise the computer's default date
    (i.e., 01-01-81). The fifth column shows the time of entry.

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6. The supplemental DOS disk has on it a number of sample programs which are used to demonstrate the capability of the computer. We will use one of the programs for the next exercise.

7. Be sure that DOS is in Drive A. Type BASICA and <ENTER>. This loads BASIC into the computer's memory.

8. Now remove the DOS Disk and place the DOS Supplemental Disk in Drive A.

9. Type LOAD "MUSIC

10. Type RUN.

11. Follow the directions on the screen and select on song.

12. Now remove the DOS Supplemental disk and make another selection. Explain what happens: _____

    _____

    _____

This activity points up the difference between the way data is stored and used on a cassette tape, compared to how data is stored and loaded from a disk.

ACTIVITY 5: FORMATTING A DISK

Until a floppy disk is formatted, it cannot store information. Formatting readies a disk for data storage by, among other things, checking the disk for bad spots and setting up a directory to record files' names, etc.

Most often it is a new disk that is being formatted. However, a disk already containing data may be reformatted. DOING SO ERASES ALL DATA PREVIOUSLY STORED ON THAT DISK. The purpose of this would be to "recycle" disks containing data not longer needed.

FORMAT is a DOS command and is typed after DOS has been booted and when the DOS prompt (A>) is displayed.

Objective: To format a disk

1. Type FORMAT. Press <ENTER>.

2. The disk in your folder marked FORMAT is the one you will format. Insert it in the disk drive.

3. Follow the instructions that appear on the monitor.

4. When the formatting is complete and the prompt asks if you will format another, press N.

5. Note the display of the number of total bytes on the disk and of bytes available. If the disk is free of "bad spots", these numbers will be equal.

6. Additions to the FORMAT command allow you to specify whether you will format only one side of the disk (FORMAT /1) and whether you will have DOS written on the disk being formatted (FORMAT /S).

Format B (easier)

PERXXII:JM.16

Control S
level

ACTIVITY 6: SAVING AND LOADING A PROGRAM

To understand the process of storing a program on a diskette and the reverse process of retrieving a stored program from a diskette, complete the following:

Objective: To be able to input a BASIC program, transfer the program to a disk and then load it back from the disk into main memory.

1. After the DOS prompt (A>), type BASIC or BASICA to return the computer to the BASIC language. Note that the DOS prompt disappears.

2. Remove the DOS disk and place the FORMAT disk in drive A.

3. Input the following program:

```
 5 REM TEST
10 LET A=12
20 LET B=3
30 PRINT A+B
40 PRINT A-B
50 PRINT A*B
60 END
```

4. Type RUN to check the program for "bugs".

5. When it runs correctly, save your work to disk by typing

    SAVE "TEST (the second quotation mark is unnecessary).

6. The in-use light of the drive should light.

7. To erase the program from RAM, type

    NEW <ENTER> (to erase the program from RAM).

8. To know that it has been erased from the computer's main memory, type LIST or RUN. Does anything happen?

9. Now retrieve the program from the disk and re-enter it in RAM by typing

    LOAD "TEST

10. Again, the in-use light should light.

11. To see that the program has been retrieved, type LIST or RUN.

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-20-

A WORD ON DRIVE IDENTIFICATION:

Most computers have either two floppy disk drives or one floppy and one hard disk. As the user, you must be able to control the operation of each drive. This is done by using the proper address protocol.

The default drive is the left drive. It is identified as drive A. The right drive is identified as drive B. The drive which you are currently working with is identified by the letter which precedes the prompt (>) sign. For example, A> means you are working in A drive, B> indicates B drive, etc. The following examples will help you as you address each drive.

```
A> B:              You are changing the default drive to B
B> A:              You are changing the default drive to A
A> Diskcopy B:     Copies disk A onto disk B
A> Copy            Copy selected files from one disk to another
A> dir B:          Will give you a directory of the disk in B
```

SOME THINGS TO REMEMBER WHEN USING DOS:

1- The drive letter must be followed by a colon.

2- You can use either lower or upper case letters in typing.

3- Check to make sure the proper disks are in the proper drives.

4- Make sure your typing is accurate.

5- The first drive you name is the source drive, the second drive is always the destination drive.

6- When using the COPY program, be sure to use this format: COPY A:*.*B:
(No space is left between the A: and asterisk, but a space is left between the second asterisk and B:).

Type B: goes to drive B

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ACTIVITY 7:   USING DOS EFFECTIVELY

In this activity, you will learn to properly address disk drives and how to use certain DOS programs.

1. Load DOS in Drive A. At the A> type DIR. What is the function of this DOS command? _____

    _____

2. Insert your formatted disk from the last exercise in drive B. Type DIR B: What happened? _____

    _____

3. The function of the colon after the B is to address a specific drive. To demonstrate this, type B: after the A>. You now would have a B>. You have named drive B as the drive which the computer is to recognize and use. All commands will now pertain to programs in drive B. How would you transfer control back to drive A?

4. DISKCOPY is another important DOS program. DISK COPY allows you to copy the entire contents of one disk to another. The following illustrates the various ways in which diskcopy can be used. DISKCOPY IS AN EASY WAY TO LET YOU BACKUP YOUR DISKS.

    NOTE: DATA DISKS SHOULD ALWAYS BE BACKED UP SO THAT IF THE DISK IS DAMAGED, YOU HAVE NOT LOST THE DATA.

    A> DISKCOPY A: B: This copies entire disk image from drive A to drive B.

    A> DISKCOPY A: This allows you to use one drive to copy. It will require a constant switching of source and destination disks.

    A> DISKCOPY B: A: This copies entire disk image from drive B to drive A

5. COPY is a much more selective command. COPY allows you to copy single file or a group of files from one disk to another. This command requires more attention to detail when it is used. The following are examples of how COPY is used.

    A> Copy A:*.* B: This copies all of the files in drive A to drive B

    A> Copy A:*.BAS B: This copies all files with the BAS extension

    A> Copy B:*.*A: This copies all files from B to A

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6. Based on the information on the previous page, please do the following:

    a) Use DISKCOPY to make a copy of the DOS disk. Place the DOS disk in B to do this.

    b) After you have made your copy, erase it by formatting the disk again. Type FORMAT B: and <ENTER>.

    c) Reverse the position of your disks, place DOS in B and the formatted one in A. Use COPY to copy over all files from B to A. Hint: the proper form is on the previous page.

7. CHKDSK is another important DOS command. It allows you to check on the amount of diskspace still available for use. With DOS in drive A, type: Chkdsk B: What will this do? _____

   _____

8. Type Chkdsk A: What will be the result? _____

   _____

Can cover up notch in disk @ c tape, & can't write on disk

*A7
B7*

APPLICATIONS SOFTWARE

The most important reason for using computers, whether they are mainframes or micros, is for the applications which they are able to perform for us. In this section of the course, we wish to examine the major applications for computers using microcomputer programs to demonstrate them.

The ease with which a user learns to use a software package is a measure of it's User Friendliness. Software programs that are easy to learn and provide the user with lots of assistance as they use it are called USER FRIENDLY. Most often, this type of program is MENU driven, that is, it provides you with menus, or options to choose from as you move through the program. Another type of software program is COMMAND driven. In this case, you use specific commands to accomplish particular tasks. In both cases, the more help you get, the easier it is to run the program. Let's face it. Most of us don't want to become programmers and the easier it is to use a program, the more quickly we will use it and apply it.

The subject of software brings up an important point. Using software is not an instant process. Time is required for individuals to learn to use the computer and the software. Time must be provided to allow new users to acclimate them-selves to the new technology. There needs to be user support in the form of training.

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In terms of volume, the most significant business applications of computer ---- mainframes, minicomputers, or microcomputers --- has been data processing, the storage of data in computer memory. The memory bank has become the common replacement for the filing cabinet.
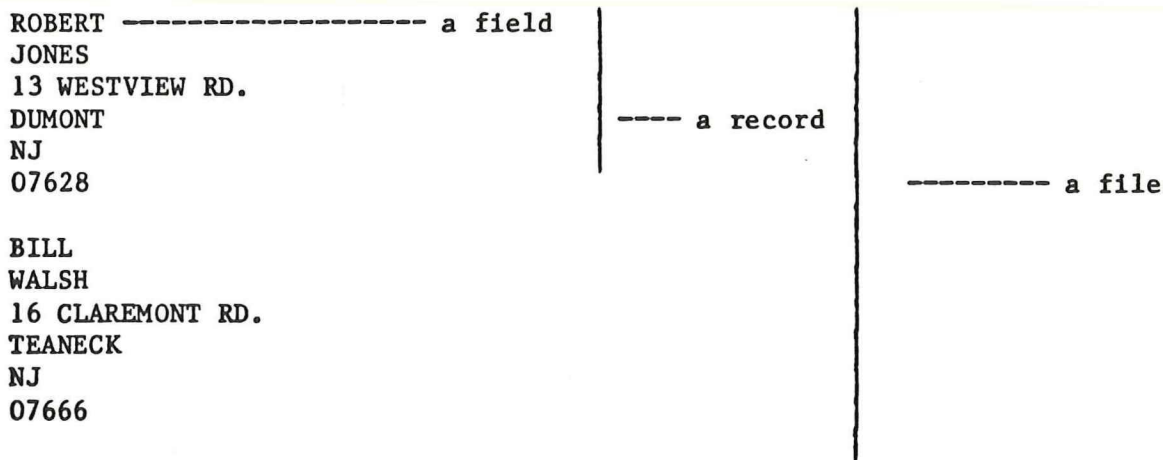
The refinement of data processing has been aimed at the elimination of several problems that previously limited the efficiency of data files.

1. Redundancy of data storage: the storage of the same data in separate files.
2. Data processing programs that used single files and so were dependent upon the format of those files -- changing the file (i.e., adding a new field of data) required changing the program.
3. Rapid technological advances resulted in new hardware and software. Changing from one kind of hardware to another or from one piece of software to another could mean time-costly alteration of the programs that manage the data.

The result is the development of data base management systems. A data base is the collection of interrelated data that are stored with as little repetition as possible. Most typically, a data base involves those data which will serve multiple applications within a business.

The basic structure of a data base if FILE > RECORD > FIELD, as diagrammed below in Figure 4.

Figure 4

```
ROBERT -------------------- a field  |
JONES                                |            |
13 WESTVIEW RD.                      |            |
DUMONT                               |---- a record
NJ                                   |            |
07628                                |            |
                                                  |--------- a file
BILL                                              |
WALSH                                             |
16 CLAREMONT RD.                                  |
TEANECK                                           |
NJ                                                |
07666                                             |
```

Electronic Spreadsheet Applications

The concept of an electronic spreadsheet is simply the merging of the spreadsheet format with the power of recalculating parts of, or the entire, spreadsheet instantaneously.

A spreadsheet is divided into columns and rows that are labeled by letters and numbers, respectively. As a result, the most basic unit of a spreadsheet is the cell formed by the grid of columns and rows. Cells are labeled by their coordinate column letter and row number. For instance, A1 is the cell located at the intersection of column A and row 1; cell AE232 is at the intersection of column AE and row 232.

The first electronic spreadsheet developed was Visicalc. This program, more than any other, put microcomputers on the map. It became the most significant factor in giving business people a reason for using micros. Since Visicalc (apple) there have been a host of other spreadsheet programs such as Supercalc and Multiplan, each doing the same chore with added variations.

Lotus 1-2-3 was the first major step forward in spreadsheet design. The most significant variations was the use of a descriptive menu instead of mnemonics. In addition Lotus integrates graphics and data file program. You can display your results graphically and employ a limited datafile function. Several programs are combined into one in Lotus. In the new Symphony package, Lotus has added word processing and communications so that your spreadsheet data can be transferred to a text or transmitted via modem to another location without reentering the data.

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ACTIVITY 8:   LOADING LOTUS 1-2-3

Objective: 1.   To load the Lotus Systems Disk and to become familiar
             with the ACCESS MENU
             2.   To become familiar with the Lotus screen

A) 1. Insert the Lotus Systems Disk in Drive A. Insert the Data Disk in
        Drive B. Turn the computer on. (If the computer is already on, type
        Ctrl-Alt-Del.)

    2. Enter the correct date and time at each prompt, or simply press <ENTER>
        at each prompt.

    3. The ACCESS MENU displays the several programs included in the Lotus
        software package. The left and right cursor movement keys will allow
        you to highlight each program title and to view the summary of that
        program on the second line of the Access Menu.

    4. Highlight the 1-2-3 option and press <ENTER>. Respond to the "press any
        key" prompt and a blank worksheet will appear on the monitor.

    5. The worksheet consists of two basic parts: the Control Panel and the
        Worksheet itself.

B) 1. The Control Panel in upper left corner describes:

        a) current location of cursor in worksheet
        b) current cursor location contents
        c) menu options
        d) current selected menu function

    2. Indicators

        a) mode indicator: upper right
        b) keyboard status: lower right
        c) error messages: lower left

    3. The Worksheet

        a) 256 columns, addressed with letters
        b) 2048 rows, addressed with numbers
        c) worksheet cursor cell: where column and row intersect

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ACTIVITY 9:   THE CURSOR MOVEMENT KEYS

Objectives: To practice use of the various means of moving the cursor in the
              Lotus program.

1. The worksheet cursor (cell pointer) may be moved in a variety of ways tin
    Lotus. These are summarized below:

    *   The four arrow keys move the cursor one cell per stroke in the
        indicated direction

    *   The HOME key moves the cursor to the upper left-hand corner, which is
        normally Al

    *   The F5 key allows you to specify the cell to which you wish the cursor
        to move. Type in the cell location (e.g., C5) then press the <ENTER>
        key to execute the command.

    *   The PgUp and PgDn keys move the screen on "page" up and down, respec-
        tively. A page is 20 lines.

    *   The Scroll Lock key when pressed causes the worksheet to move behind the
        cursor rather than have the cursor move over the worksheet. (The cursor
        is fixed and the screen moves.)

    *   Move to cell D55. Press Scroll Lock and move your cursor key. Note the
        cursor key stays in D55 and the worksheet moves. When you are done,
        Press Scroll Lock again to disable the function.

    *   The Tab key and the Tab key + Shift key scroll on "page" right and left,
        respectively. A page is 72 characters.

2. Press F5 and enter IV2048. You are at the lower right of the worksheet.
    Type HELLO and <ENTER>. Note if your computer has insufficient memory to
    store the worksheet, an error message will appear. (Memory Full)

3. With a blank worksheet on the monitor, practice using the several keys and
    combinations that will move the cursor.

4. You may wish to locate the following cells by the various means available:

    A42   IV2045   BC354   D1024   H4   M23   HZ1

(Control, alternate
delete to
warm boot
into any but
can use for Lotus
B.

ACTIVITY 10:   THE COMMAND TREE

Objectives: To become familiar with the Command Tree concept
              To practice accessing the Command Menu
              To learn to use the following commands:
                  File Retrieve
                  Range - Label-Prefix
                  Copy
                  Range Erase
                  File Save
                  Worksheet Erase

 1. With a blank worksheet on the monitor, press the / key. Notice the Command
     Menu on line two of the Control Panel.

 2. FILE RETRIEVE: Using the cursor movement (arrow) key, highlighting the menu
     choice File and press <ENTER>.

 3. A secondary menu appears containing options for accessing and manipulating
     files saved on the data disk.

 4. As the Retrieve option is highlighted, press <ENTER> to retrieve a file from
     the data disk.

 5. Respond to the "enter name on the file" prompt by either of the following:

        * type the name of the file PERSBUDG and press <ENTER>

        * highlight the file name PERSBUDG and then press <ENTER>

 6. RANGE: With the cursor in cell A1, type / to access the Command Menu.
     Select the Range sub-menu. (You may highlight the word Range, then press
     <ENTER>; or you may simply type the initial of your menu choice, R in this
     case.)

 7. LABEL-PREFIX: From the secondary Range menu, select Label-Prefix.

 8. ALIGN (RIGHT): To align a range of labels with the right border of their
     cells, select Right.

 9. Specify the range of labels by "pointing" --- moving the cursor down to A20
     --- then pressing <ENTER>.

10. Now re-align those labels with their cells' left border.

11. COPY: A range of cells may be copied to another position on a worksheet.
     Place the cursor in cell A8. Type / to access the Command Menu.

12. Select the Copy option and respond to the "Enter range to copy FROM" prompt
     by moving the cursor to A20. Note the highlighted range of cells. Press
     <ENTER>.

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13. Respond to the "Enter range to copy TO" prompt by moving the cursor to B22 pressing the period (.), then moving the cursor to B34 and pressing <ENTER>.

NOTE: PRESSING THE PERIOD (.) IS KNOWN AS ANCHORING THE RANGE. WHEN YOU PRESS THE PERIOD (.), LOTUS KNOWS TO DEFINE A RANGE STARTING WITH THAT CELL.

14. Note that the range of numbers has been copied to the new location.

15. RANGE ERASE: Place the cursor in B22. Type / R E. Point to B34 and press <ENTER>. You have erased a range of cells.

16. Press HOME.

17. FILE SAVE: To save a worksheet on the Data Disk, access the File Menu by typing / F.

18. Choose the Save option.

19. Pressing <ENTER> and choosing the R (Replace) option will save the PERSBUDG file under its original name.

20. WORKSHEET ERASE: Typing / W E Y will erase the current worksheet from computer memory and from the monitor screen. Observe the control panel as you enter these commands.

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ACTIVITY 11: ENTERING DATA (LABELS, VALUES, FORMULAS)

Objectives: To use the help menu
To practice additional Lotus commands
To enter data on an existing worksheet
To understand use of formulas
To distinguish between relative and absolute cells

A. USING THE HELP MENU -F1

1. The HELP MENU is accessed by pressing F1.

2. The Help Menu can be accessed while in a command or worksheet mode. The Help Menu assists with the task at hand.

3. The Help Menu operates on multi-levels starting from general to specific.

4. Press ESC to return to worksheet or command.

5. Try the HELP function now. With the blank worksheet in place, press F1. A Help Menu is now on the screen. Select a topic and press <ENTER>. Continue with this process until your questions are answered.

6. Press ESC and return to worksheet. Access a command, your choice, and press F1. Note that you have a help screen referring to that command. Press the ESC key to return to the command you are in.

B. ENTERING LABELS

1. Labels starting with letters are simply typed into the target cell.

2. Labels starting with a number of mathematical symbols must be preceded by a label prefix which also aligns the label as follows:

(') will align the label to the left
(") will align the label to the right
($\wedge$) will align the label to the center

3. Column labels can be underlined to separate from the data by using data by using the / (backslash) and either the - or = sign. The / will repeat a label across the whole cell. To repeat the cell across all columns, use the COPY command.

C. USING FORMULAS

1. A formula is classified as a value by Lotus. It is at the heart of a spreadsheet's usefulness. The formula consists of a mathematical operator and two or more data values or constants to be used. These are the standard arithmetic operations and their respective Lotus symbols.

OPERATION	SYMBOL
Addition	+
Subtraction	−
Multiplication	*
Division	/
Exponentiation	**

2. Entering formulas is accomplished by prefacing the first number or constant with either symbols such as the $ or an operator symbol. The most common operator used is the (+). The formula constants can either be numbers or cell locations. The @ symbol is used to preface functions. Examples are:

   a) 9+11   b) +A1+B1   c) @SUM(A6..A12)

3. In formulas, the order of mathematical operation occurs as follows: exponentiation is performed first; multiplication and division are performed second; addition and subtraction done last. If there are more than one of an equal operation, Lotus performs equals from left to right. The order of operation can be modified by the use of parentheses.

4. RECALCULATION: It is important to understand the way in which Lotus recalculates formulas and values. Each time you make a revision to value which is related to other cells, Lotus will recalculate affected cells. Lotus performs recalculations AUTOMATICALLY, and in NATURAL order. That is: recalculations are made to the entire worksheet each time you make changes. The cells are recalculated in a natural order, this means that the formula is not recalculated until the formulas it depends on are recalculated. RECALCULATION is accessed by pressing (/ W G R). These are your options:

   a) MANUAL RECALCULATION: allows you to perform recalculations on command. Use F9 to start recalculation.

   b) COLUMNWISE CALCULATION: allows you to process formulas, column by column.

   c) ROWWISE CALCULATION: allows you to perform calculations row by row.

   d) ITERATION: allows you to specify the number of times you want Lotus to cycle through the worksheet recalculating the formulas each time it does so.

5. CIRCULAR references. A circular reference is when the value in a cell depends indirectly on itself. In this example the value of cell E3 depends on itself.

	A	B	C	D	E
1					
2					
3	5	10	20	35	@SUM(A3..E3)
4					

When Lotus detects a circular reference, it will indicate so in the keyboard window in the lower right.

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D. ENTERING DATA IN AN EXISTING FILE

1. Retrieve the BUDGET file. (/ F R BUDGET <ENTER>)

2. Move the cursor to A12. Note that the cell contains a label.

3. Move the cursor to B12. Note that the cell contains a value.

4. Move the cursor to D40. Note that the number 5 appears on the worksheet,
    but it is actually a formula.

5. Position the cursor at A1. Enter the command menus by pressing the (/) key.
    Type (R) for Range, (L) for Label-Prefix, (R) for Right. When asked what
    range, move the cursor down to A45. Try using the PgDn key twice to get you
    most of the way down. When you are in A45 and the range A1..A45 appears on
    the edit line, press the <ENTER> key.

6. Move the cursor to A4. This time just change this cell to the center of
    the column. (/ R L C <ENTER>).

7. Note the label-prefix for left, right and center.

8. Move the cursor to A1. We want to make a copy of the labels in column A and
    put them in column J. Press (/) to access the commands, (C) for Copy. When
    prompted for range to copy FROM, move cursor down to A45 so range reads
    A1..A45. Indicate you are done specifying the FROM portion of the COPY by
    pressing <ENTER>. When prompted for the TO portion, move the cursor to J1
    and press <ENTER>.

9. Move your cursor to J1 to make sure the labels are there.

10. Column Width: The labels in column J cover three columns. If we want to
    put data in columns K and L, column J must be wider. To make it wider type
    (/ W) for Worksheet, (C) for Column-width, (S) for Set. Since we don't know
    how wide column J has to be, when it prompts for width, use your right arrow
    key and keep expanding the column until all of column J's labels appear in
    column J. When the column is wide enough (27 characters), press <ENTER>.

11. Window: To keep the labels in Column A in view while scrolling to other
    portions of the screen use the window function.

        - move cursor to B1
        - access the menu   /
        - select Worksheet   W
        - select Window   W
        - select Vertical   V

    Note that two vertical borders appear. Press F6 function key to move cursor
    to right portion of screen. Move cursor to right off screen to see what
    happens. To cancel window use /WWC (Clear).

12. Try Horizontal Windows - /WWH.

13. Scrolling is Synchoronized so both panels move together. Press /WWU
    (Unsynch) and see what happens.

14. If we now want to eliminate the labels in column J, YOU NEED TO BE IN J1, we
    would type (/), (W) for Worksheet, (D) for Delete, (C) for Column, <ENTER>
    to only delete column. Note: column J's column size is now the same as the
    rest of the worksheet.

ACTIVITY 12: WORKSHEET DESIGN

Objectives: To become familiar with Column-Width Command
             To become familiar with the Insert Command
             To learn to underscore headings for clarity
             To enter vertical lines between columns
             To practice entering data, formulas, and labels

(Examine the printout of the Worksheet on the following page)

1. Retrieve the file SCHEDULE - Personnel Schedule (/ F R Schedule <ENTER>.

2. COLUMN-WIDTH: Position the cursor in A5 and type / to access the Command
    Menu. Select the Worksheet option, then the Column-Width option.

3. Respond to the prompts to Set the width of column A to 24, then press
    <ENTER>. (/ W C S 24 <ENTER>)

4. Now enter the heading Associate Name.

5. The A column is now wide enough for labels such as:

            (B8)   Richard Buehler
            (B9)   Donna Marie Kingsboro
            (B14)   Shirley Hurdle

6. Move the cursor to C5.

7. INSERT: Type / to access the Command Menu. Type W for Worksheet. Type
    I for Insert.

8. Select the Column option, for you will insert two columns between the
    existing B and C columns. (/ W I C)

9. The column insert range will be C5..D5. Press <ENTER>.

10. Enter the heading Initials in C5.

11. Move the cursor to D5. You will insert a new column.

12. Type / W I C. Press <ENTER>.

13. UNDERSCORING: In A5 type / press <ENTER>. The backward slash repeats
     a character(s) throughout a cell.

14. COPY: Copy the underscoring from A5 to R7. (/ C <ENTER>, type period (.),
     point to R7, press <ENTER>).

15. Move the cursor to D6.

16. Now set the D column's width to 1 space: / W C S 1 <ENTER>.

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17.   VERTICAL LINING: In D6 type the | character. Copy this from D6 to D27.
      (Similiar to step #13 above, but vertical rather than horizontal.)

18.   Save your file to disk under your name. (/ F S (name) <ENTER>.

19.   Compare the revisions you have made in SCHEDULE with the printout of the
      original.

NOTE: This activity demonstrates how easily we can modify an existing
       worksheet. However, the larger the worksheet becomes, the more difficult
       it is to make changes. Therefore, it pays to plan ahead. We will not
       save these changes.

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ACTIVITY 13: WORKSHEET DESIGN
(Practical Example)

Objectives: To practice entering formulas
             To practice copying
             To become familiar with formatting

1. Retrieve the file CENTER 17.

2. Examine the values entered in columns G, I, and K.

3. Move the cursor to M6. Enter the label ITEM TOTAL and press the right arrow key.

4. Enter the heading PERCENT in N6. Press the right arrow key.

5. Now we will enter the formulas required to compute what was asked for.

6. The column headed "Total" will contain a formula that calculates the sum of Periods 1, 2, and 3 for each M8 item.

7. Enter this formula by positioning the cursor in M8, then typing +, pointing to G8, typing +, pointing to I8, pointing to K8, pressing <ENTER>.

8. In cell N8, you will enter the formula that calculates the percent of total annual budget that the three period total represents.

9. The formula for cell N8 will be division of item total by annual budget (M8/E8). Enter this formula.

10. To change the percentage in column N to percent format, type / to access command menu, select range option, format option, percent format, 0 decimals. Press <ENTER> twice.

11. We now need to copy all of the formulas in the range M8..N8 to range M8..N16.

12. Place the cursor in M8 Press / to access the command menu, select the copy option and point to N8. Press <ENTER>.

13. Type in the range to copy to. Type M8..N16. Press <ENTER>. Note that all of the formulas have been copied at the same time.

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EDITING THE WORKSHEET

1. DELETING DATA IN COMMAND LINE

   a) Use ESC key

2. EDITING CELL PRIOR TO ENTRY

   a) BACKSPACE key erases character to the left of the cursor, one at a time.

   b) ESC key erases entire entry.

3. EDITING CELL AFTER ENTRY IS COMPLETED

   a) Re-enter new Data and (E). New input will replace original data.

   b) Use Range Erase command (/ R E) to clear cell(s) if cell(s) to be empty.

4. USE OF EDIT MODE (F2)

   a) EDIT MODE allows editing of cell contents. A new formula will automatically result in recalculation of cell(s) contents.

   b) EDIT MODE accessed by use of F2.

   c) Use of cursor keys, BACKSPACE, and DEL keys will allow for editing.

   d) Press ESC key twice to return to READY MODE and leave original contents intact.

   e) Press <ENTER> to have new information put into cell and end EDIT MODE.

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ACTIVITY 14: USING THE F2 KEY

Objective: To learn additional functions to help correct errors and make changes.

1. CENTER17 should be on your screen.

2. Move cursor to A2.

3. Press F2 key.

4. Note that the information in cell A3 appears on the edit line.

5. Move the cursor with the left arrow key under the "0" in COST and type any letter.

6. Strike the Delete key to delete the "0", then <ENTER>. The new name has been inserted.

7. Use this procedure to change other data in various cells.

B. CHANGING VALUES AND EDITING FORMULAS

1. One of the reasons spreadsheets like Lotus are so popular is that we can change values and formulas in the worksheet and have the rest of the spreadsheet be recalculated automatically. However, there are special times when we don't want the spreadsheet to recalculate each time we make a change. This is most often true when we have a large spreadsheet and it takes several seconds to recalculate after each change. We can disable automatic recalculation and use the F9 function key instead. Try it. Use CENTER17 worksheet and press (/ W G R M). This will disable the AUTOMATIC : RECALCULATION. Now change the amount in cell G8 to 100. Note nothing happens, but CALC will appear at the lower right. Now press F9 and the worksheet will recalculate and CALC will disappear. Return calculation to automatic (/ W G R A).

2. Move to cell M16 and press F2. The formula is now on the status line for editing. Move the cursor under the L and type E and press the DEL. Key. The result is the formula is now changed. Press <ENTER>. The value is also changes.

3. The presence of ERR in a cell indicates that one or all parts of the formula in a cell have been deleted or are missing.

4. If rows or columns are inserted or deleted within a range, LOTUS will adjust the formula to include or exclude the cells.

5. LOTUS automatically will enter the EDIT MODE if labels or formulas are entered incorrectly. In cell M18 enter @M8.M16). Press return and note what happens. Correct the formula.

PRINTING

Spreadsheets are of little value unless you are able to see the hardcopy. The Lotus printing commands allow you to print out the entire spreadsheet, portions of the spreadsheet, the spreadsheet with values, or a line by line listing of the contents of each cell. The latter is useful in documenting the spreadsheet. The following outlines some of the capabilities of the printing commands.

- Options

  * you can print directly

  * you can establish a print file this is useful for two reasons:

    a) you might want to save the format of the file for later printing

    b) you want to use the data in another program, such as Wordstar.

- Printing controls

  * Page formatting, you have a wide range of margin options on all four edges of the paper.

  * Set-up strings (compressed print, bold print, etc.)

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ACTIVITY 15: PRINTING A DOCUMENT

Objective: To learn how to use the print commands to print data

1. Retrieve the file EXPENSE. (/ F R MTPDATA <ENTER>).

2. Type / P F to get the file option in the print menu.

3. Enter the file name PRINT <ENTER>.

4. In the File Menu select Range. The cursor should be in cell Al. Press period (.) then move cursor to last cell in data to be printed. To do this quickly press (END) then (HOME) and <ENTER>.

5. Type "O" for Options Menu.

6. In the Option Menu type "M" for Margins. The default margins are 5 (left) and 75 (right). If compressed print is used the right margin can be up to 132 characters. Press <ENTER> after each entry of margins.

7. The Setup selection allows for determining compressed print. For ok data, the entry of /0278/029 will give compressed print. Default or /018 results in normal print.

8. When attached to a printer, enter GO in the print menu to start the print function. To save the print document on disk with the printing parameters established, press "Q" for Quit.

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To access the ISG system:

A. To use from A> prompt on screen-
        1. remove any disk that might be in Drive A
        2. insert disk marked AST-PCOX in Drive A and close door
        3. type px r [return]   (don't forget space between x and r)
        4. after approx. 15 seconds the screen will tell you to enter
           "ALT and SCROLL LOCK" to bring up the ISG login screen.
           While holding down the ALT key press the SCROLL LOCK key.
        5. to return to A> prompt press ALT-SCROLL LOCK again.

B. to use from "power off"-
        1. insert disk marked AST-PCOX in Drive A and close door.
        2. turn power on to monitor and computer.
        3. after approx. 45 sec. follow step 4 in A. procedure.

Activity 1 : ACCESSING THE ISG MAINFRAME COMPUTER

Objective :   1.   To access the ISG computer by using
                   the IBM-PC.
              2.   To become familiar with changing from
                   ISG to IBM-PC and back again.

A)   1. Insert the AST - PCOX disk in Drive A. Turn the computer on. (If
        the computer is already on , type Ctrl-Alt-Del.)

     2. When the computer prompts you, type Alt-ScrollLock. You may now log
        on the ISG computer similiarly to the old IBM terminal.

         *The special function keys that were previously used on
          the old terminal are now configured as shown on the
          keyboard diagram that in located on the top of the
          keyboard.

     3. Type command to logon system.
     4. After screen says terminal is connected type second logon command.
     5. Next enter user ID code (don't use the enter key)
     6. Enter password (this will not show on screen)
     7. Use the tab key (-->|) to the selection you wish to chose. For
        this activity use the inquiry. Type an X beside inquiry and hit
        the enter key.
     8. Using the tab key to change fields enter in the exact name of the
        associate you wish to see and hit enter.
     9. Next select the function code number and hit enter.
    10. When finished, use the PF1 key (ALT-1)to start the exit process.
    11. Use the CLEAR fuction (ALT-F2).
    12. When screen goes blank type /EXIT then type /RCL to return to
        main menu.

B) Change system back to A>

     1. Use the ALT-ScrollLock combination to get the A>.

NOTE: the ISG computer is still loaded in the system and can be accessed
      anytime as long as the IBM-PC is not rebooted.

To access the VAX system:

A. To use from A> prompt on screen-
   1. remove any disk that might be in drive A
   2. insert disk marked SMARTERM 125 in Drive A and close door
   3. type ST125 [return]
   4. after approx. 15 seconds the screen will prompt you to select
      a device to attach to. Type 2 to select the VAX.
   5. the screen will go blank and within 10 seconds be ready to log
      on to the VAX.
   6. hit the enter key to bring up the USERNAME: prompt.
   7. to return to A> hold down the ALT key and press the X key.

B. To use from "power off"-
   1. insert disk marked SMARTERM 125 in Drive A and close door.
   2. turn power on to monitor and computer.
   3. after approx. 45 seconds follow step 4 in A. procedure.

ACTIVITY 1: ACCESSING THE VAX COMPUTER

Objective :   1. To access the VAX computer to obtain
                 specific information.

A)   1. Insert the disk marked SMARTERM 125 in Drive A. Turn the computer
        on. (If the computer is already on, type CTRL-ALT-DEL)
     2. When the screen prompts you type 2 to select the VAX.
     3. After screen goes blank hit the enter key to bring up USERNAME:
        prompt.
     4. Type MASS (remember to have CAPS LOCK on)
     5. Type MASS again for password.
     6. Type 02 to view group schedules by area or function.
     7. Type CO to select the computer group.
     8. Type C to view current week.
     9. Type N not to receive printout.
    10. After viewing schedule type E to exit system.
    11. Type LO to logoff system and then ALT-X to get to the A> .

WORD PROCESSING SOFTWARE

With the introduction of computers in the business place and especially the wide acceptance of personal computers it was a logical sequence of events that started the development of word processing software. The amount of time spent by a typist to retype a document just to make one change was staggering. With the introduction of word processing changes became less of a headache. It is very convenient to type a document, proof it on the screen, make changes, then send it to a printer.
The earlier word processors were stand alone computers that were dedicated soley to the task of word processing. They did not have many special features such as fast cursor movement around a page, and large storage areas for documents.

The newer word processors come in the form of software that can be used on many different types of computers. The advantage to this is that the computer can also be used for other purposes when not being used as a word processor. There are many different types of word processing software available such as Wordstar, Word, Wordperfect, and Multimate. Though basically the same, each boasts of special features that make it better than the others.

Once a system has been chosen it will require a certain amount of time for a user to become familiar with the system. This learning time may only involve a few hours or can take months to become a proficient user. Fortunately the basics of creating a document do not take much time and once the user gains confidence using the system the desire to learn more usually increases.

ACTIVITY 1: LOADING MULTIMATE

Objectives   1.   To load the Multimate word processing system
                  in the IBM-PC.
             2.   To use various fuctions of Multimate.

A)   1. Insert disk marked Word Processing System Disk in
            Drive A. From the A> type WP (this is the program name
            that starts the Word Processing system).
        2. Follow the instructions on the screen and press the
            space bar to continue. What follows is called the
            main menu. Notice the different options available.
        3. Select option 1 and hit the enter key.
        4. Type HELP to select the document named HELP and hit
            enter.
        5. Review information on screen and pressthe F10 key.
        6. Use the four arrow keys on the numbers keypad to move
            the cursor around the screen.
        7. Use the PgUp and PgDn key to move one screen up or
            down.
        8. Press the END key to move to the end of text on the
            screen.

B)   1. Press F1 and type a three to bring up page three of
            the document.
        2. Press F9 and move cursor out to column 40 . Press the
            DEL key until the right arrow is over the cursor.
            Press F9 again and watch what happens.
        3. Repeat step 2 and change back the format line to 65
            columns. While in the format line delete two of the
            tab marks by moving the cursor to the left of the tab
            mark and hit the space bar.
        4. Position the cursor under the right arrow mark above
            the word "NOTE" . Press the Ins key to insert text.
            Press the F3 key to center text that you are going to
            type, and type the word NOTE in caps. Press the Ins
            key again.
        5. Move the cursor to the word NOTE: and put the cursor
            under the N
        6. Press the Del key and then the right arrow key until
            the cursor is under the colon. Press Del again.
        7. Press F10 to save document.

ACTIVITY 2 : EDITING A DOCUMENT

Objective 1. To become more familiar with editing features.

A)   1. Use option 1 to edit the document titled "SALES".
      2. Retrieve SALES and use F10 twice to show the first page
         of the document.
      3. Add the following text ahead of the first paragraph:

             Are you considering the purchase of a new home
             computer? If so, do we have a great offer for you.

      4. Change the date on the first line.
      5. Change the date on the last line to 1 month from the
         current date.
      6. Add this paragraph at the end:

             Fill out the attached form and drop off at the
             data processing room to receive more information.

      7. Press F2 to start a new page.
      8. Type the following on page 2:

        DATE:_____

        NAME:_____

        ADDRESS:_____

                _____

        COMPUTER TYPE:_____

ACTIVITY 3 : CREATING A DOCUMENT

Objective 1. To create your own document using Multimate

A)   1. Use option 2 from main menu.

      2. give your document a name.

      3. Press F10 twice and then start typing you document.

      4. Remember to press F10 to save your document when you

         are finished typing.

ACTIVITY 4 : PRINTING A DOCUMENT

Objective 1. To obtain a printed copy of a document.

A)   1. From main menu select option 3 Print Document Utility.

      2. Type in name of document and press enter.

      3. Change any options to obtain the desired effect on the

         finished document.

      4. Make sure printer is ready

         a. printer is turned on

         b. paper is in printer

         c. SEL light is on

      5. Press F10 to print document

F1 - GO TO PAGE

1. Press the Go To function key F1.
2. Type in the page number you wish to transfer to.
3. Press the Return key.

F2 - PAGE BREAK

1. When you have finished entering the text for a page, press the Return key.
2. Press the Page Break function key F2.
3. If editing an old document, move the cursor under the first character to appear on the new page. Then follow instruction 2.

F3 - CENTER

1. Move cursor to the beginning of the line where centering is to take place.
2. Press Center function key F3.
3. Type the text to be centered.
4. To end the Center function, press Return.

F4 - INDENT

1. Move the cursor to any position in a line before the tab stop in the Format Line.
2. Press the Indent function key F4.
3. Type in the text to be indented.
4. Press the Return key.

F5 - LIBRARY

1. Move the cursor to the position whre Library Text is to be inserted. (Note, you must have performed "Library Attach" prior to this.)
2. Press the Library function key F5.
3. Type the 1 to 3 character Library Entry Name to be inserted.
4. Press the Return key.

F6 - SEARCH

This function will locate a word, character string or format line.

1. Move the cursor to the position in the document where the Search function is to begin.
2. Press the Search function key F6.
3. Type in the work or character string you want the system to search for.
4. Press the Search function F6.
5. At this time, you may press the Search function key F6 again, --OR--
   You may edit the work or character string, but it will end the Search Mode.
   To resume the Search after editing, press the Search function key F6.
   TWICE.
6. Press the Escape key Esc at any point during the process to cancel the Search command.

For Format Line:

1. Move the cursor to the position where the search for the format line will start.
2. Press the Search function key F6.
3. Press the Format Change key F9. The system will do a search for the first occurrence of a format line.
4. Press the Search function key F6 once again to position the cursor at the next occurrence of a format line.
   OR
5. Edit the format line by pressing the Format Change function key F9. After modifying the format line press F9 again to set the format line.
6. To resume the Search Format line after editing press the Search function key F6 and then press the Format Change key F9.
7. Press escape Esc to end search command.

F7 - MOVE

1. Move cursor on the first character or symbol to be moved.
2. Press the Move function key F7.
   To move the current format line along wit Text, press the Format function key F9.
3. Use the Highlighting Process to identify the text to be moved.
4. Press the Move function key F7.
5. Move the cursor to the new location where text is to be inserted.
6. Press the Move function key F7.

F8 - COPY

1. Move the cursor on the first character or symbol to be copied.
2. Press the Copy function key F8.
   (You will be prompted from this point on.)
   To copy the current Format Line along with the text, press the Format function key F9.
3. Use the Highlighting Process to identify the text to be copied.
4. Press the Copy function key F8.
5. Move the cursor to the new location where the text is to be inserted.
6. Press the Copy function key F8.

PER:XXIII:JM.1

F9 - FORMAT CHANGE

1. Press the Format Change function key F9.
2. Modify the format line using the cursor positioning arrows to move the cursor, the -->| key to set tabs, and the Return key to set line length.
3. Press the Format Change function key F9.

F10 - SAVE/EXIT

After typing in text, press the Save/Exit key F10.
The system will save your document and return you to the Main Menu.

FORMAT LINE SET UP

To enter Format Line:

Press the Format Change function key F9.
Use the <--- and ---> to position the cursor, the -->| key to set tabs,
the Space Bar to remove tabs, and the Return key to set the line length.
To exit Format Line: press F9.

AUTO UNDERLINE - TEXT

1. Move cursor to position where Auto Underline is to start.
2. Press Alt -.
3. Type in characters to be underlined.
4. To exit the Auto Underline mode, Press Alt -.

HELP

1. Press Shf F1.
2. When you are finished reviewing the Help screen, press the Return key.

PAGE COMBINE

1. Move the cursor to the end of the first page you wish to combine.
2. Press Shf F2.

SUBSCRIPT

1. Move the cursor to the position before the first alphanumeric character to be lowered.
2. Press Alt W.
3. Type in the alphanumeric characters to be printed lower than the main printing line
4. Press Alt Q.

SUPERSCRIPT

1. Move the cursor to the position before the first alphanumeric character to be raised.
2. press Alt Q.
3. Type in the alphanumeric characters to be printed higher than the main printing line.
4. Press Alt W.

PER:XXIII:JM.2

PAGE LENGTH

1. Press Alt F2.
2. Enter the number of lines you want per page of the document (eg. 46, 51, etc.)
   The system will warn you when you type this past this line.
3. Press the Return key or the Save/Exit key F10 to set the Page Length.

RETURN

Press the Return key to:

End a line and return to the left margin.
End the last line in a paragraph.
Show blank lines.
Set right margin in format line.
Exit from Menus and Help screens.
End function commands, such as center, indent, etc.

TAB

1. Press ---⟩| key one or more times. The cursor will move to the position in
   the current line indicated by a tab stop previously set in the format line.
2. Type in text. If desired, you may press the ---⟩| key, or Indent key F4 again.

HIGHLIGHTING PROCESS

1. Press the Delete function key Del, the Move function key F7, the Copy func-
   tion key F8, the External Copy function combination Shf F8.
2. Use any of the following keys to highlight the text:

A.	Word......................Alt F5	J.	Line........................Alt F6
B.	Sentence..................Alt F7	K.	Paragraph...................Alt F8
C.	Right Cursor..............---⟩	L.	Tab........................---⟩	
D.	Down Cursor...............	M.	Return.....................Return
E.	End......................End	N.	Next Page..................Cntrl PgDn
F.	End of Page..............Ctrl End	O.	Next Word..................Ctrl ---⟩
G.	Go to Page..............F1	P.	Hardspace..................Alt S
H.	Character Search.........Any Charct.	Q.	Indent.....................F4
I.	(A, B, 1, 2, %, !, *, etc.)	R.	Scroll Right.............Alt F4

3. Highlighting text may be De-Highlighted with the use of the following keys:

A.	Left Cursor...............⟨---	F.	Previous Page..............Ctrl PgUp
C.	Home.....................Home	G.	Previous Word.............Ctrl ⟨---
D.	Top of Page..............Ctrl Home		
E.	Go To Page...............F1		

INSERT MODE

1. Move the cursor on the character or symbol which will immediately follow the
   text you want to insert.
2. Press the Insert function key Ins.
3. Type in text, characters, or symbols to be inserted.
4. Press the Insert function key Ins to exit the Insert mode.

PER:XXIII:JM.3

HOME

Press the Home key. The system will move the cursor to the top of the current
screen.

DELETE

1. Move the cursor under the first character or symbol to be delted.
2. Press the Delete function key Del.
3. Highlight the characters or symbols to be deleted.
4. Press the Delete function key Del.
5. Press the Escape key Esc at any point during the process to cancel the
    Delete command.

END

1. Press End.
    The system will move the cursor to the bottom of the current screen.
2. If you are using the Go To Page function Fl End is used to specify
    the last page of document.

FORMAT LINE CONTROL – Press the function key(s) indicated:

FUNCTION	KEY(S) TO PRESS
Format Change	F9
Format Current	Shf F9
Format Delete	D
Format Line Replace	Shf F6
Format Line Search	F6
Format Line Setup	F
Format Page	Alt F9
Format System	Ctrl F9

PRINTING FUNCTION - Press the function key(s) indicated:

FUNCTION	KEY(S) TO PRESS
Automatic Page Numbering	#
Bold Print	Alt Z
Draft Print	Alt D
Enhanced Print	Alt N
Footers	Alt F
Headers	Alt H
Merge Print	Alt 5
Pause Print (Stop Print)	Alt P
Pause Printer	Alt P
Print Current Document	Alt 3
Print Queue	Q
Printer Control Code	Alt A
Printer Control Utilities	Alt 4
Shadow Print	Alt X
Stop Printer	Alt P
Subscript	Alt W
Superscript	Alt Q
Underline	Shf −
Underline − Auto (All Text)	Alt −
Underline − Auto (Alphanumeric)	Alt =

MURPHY'S LAW FOR COMPUTERS

You can never tell which way the train went by looking at the track.

Logic is a systematic method of coming to the wrong conclusion with confidence.

Whenever a system becomes completely defined, some damn fool discovers something which either abolishes the system or expands it beyond recognition.

Technology is dominated by those who manage what they do not understand.

If builders built buildings the way programmers wrote programs, then the first woodpecker that came along would destroy civilization.

The attention span of a computer is only as long as its electrical cord.

All great discoveries are made by mistake.

Always draw your curves, then plot your reading.

Nothing ever gets built on schedule or within budget.

New systems generate new problems.

To err is human, but to really foul things up requires a computer.

Any given program, when running, is obsolete.

Any sufficiently advanced technology is indistinguishable from magic.

A computer makes as many mistakes in two seconds as 20 men working 20 years make.

The primary function of the design engineer is to make things difficult for the fabricator and impossible for the serviceman.

THE COMPUTER AND ORGANIZATIONAL INFORMATION MANAGEMENT

THE INFORMATION REVOLUTION:

We are in the midst of an information revolution and there is no indication that the end is in sight. The computer is to the current revolution what the steam engine was to the industrial revolution. With many similarities existing between the two in terms of effect, there is a difference. That difference is the speed with which computers have been introduced and integrated into our companies. What took one hundred years in the industrial revolution is taking ten or even less in the information revolution. As a result of this rapid change, we need to educate ourselves as quickly as possible about the technology and its ramifications.

Computers have been an integral part of our organizations for the past thirty years or more, but individually, we have had little direct contact with the technology. The microcomputer is changing all of that. These desktop devices are now found in every department as compared to the mainframe which was located in one place with terminals in selected areas. The result is that information control, which was in the hands of information services alone, is now being diluted. John Nesbitt in his book 'MEGATRENDS' predicts the demise of the hierarchically structured organization for that very reason. Understanding the microcomputers role in information management is the first step we must take if we are to keep the upper hand in controlling information within our organization.

APPLICATIONS:

This understanding begins with a look at microcomputer applications. Microcomputers are used for a variety of tasks with decision support being a major application. Using a spreadsheet program such as Lotus 1-2-3 for example, the user has the ability to play the "what...if"game. Data manipulation and management is facilitated by the use of programs such as dBase II, to name one of the most popular packages. Microcomputers are finding uses as word processors, graphics generators, and project managers as well. The number of applications is endless and bounded only by the capacity of the computer, the innovative thinking of the user, and availability of software.

COMMUNICATIONS:

Of great interest is the area of communications. We are all familiar with the concept of the Electronic Office where computers are "talking" to other computers and word processors through a networking system. This results in increased communication speed and productivity.

Communication is a significant factor outside of the office as well. The linking of computers via MODEMS and existing communications networks will enable more work to be done at home or away from the office. A good example is the simplification of the salesmens tasks in transmitting orders to the home office.

TRAINING:

Earlier, we made an analogy between the industrial revolution and the information revolution. One of the major similarities between the two is the impact which they have on people. The human issues are significant. Just as there was fear of the engine, so is there fear of the computer. There is a need for user support making training an important component of the implementation process. It takes, on the average, between sixty and eighty hours to become proficient with Lotus 1-2-3, when learning is based on trial and error. It takes less than half that amount with organized training assistance. The time element points up another issue, and that is expectations. What do we expect from the new technology? It is unrealistic to assume that an individual can improve his productivity immediately by using a microcomputer. The reality is reversed as the individual gets up speed on the machine. As important as learning the new technology is allaying the concern of the employee that the computer will make them obsolete or downgrade their jobs. As with other new technologies, expanded work can be done with less drudgery.

POLICY ISSUES

Training and planning go hand in hand. Good solid literacy training addresses the most important policy issues. People who understand these issues are more likely to comply with control measures established by their organization.

I. DATA SECURITY
Data security, the long standing concern of every DP department, becomes an even bigger issues with PC's. Disks fit easily in purses, brief cases and even pockets. They can be copied with ease. They are often carelessly handled to be left lying around on tables and desks.
The problem goes far beyond outright dishonesty. It also encompasses the fragile nature of the information on the disks. A disk left next to a ringing telephone may be erased. Even placing a disk on top of the CRT jeopardizes its contents. Smoke, pencil and pen pressure and even bending the disk are harmful. Accidentally erasing data through misuse of computer commands tops off the list of threats to data security.

II. SOLUTIONS
Controls on where the disks are kept and who has access, possible use of sign-in sheets, and training are all useful. Use of back-up disks is essential.

DUPLICATION OF EFFORT

According to Judith Wilson in a recent article in "Computer Decisions", one of the stages people go through in their microcomputer learning experience is excalation. Everyone wants to use their PC for more and more purposes. Great, but two problems emerge:

1. Several people spend literally hours developing a software application to perform the same function.
2. Data already satisfactorily handled by the mainframe is re-entered and processed by a micro.

I. SOLUTIONS

1. A computer newsletter is an excellent vehicle to keep users informed about applications currently being developed. One section might look like this:

   1. Cost/Productivity Analysis-
      Fred Smith, Accounting Dept.,
      Ext. 2104.
   2. Departmental Budget-
      Jean Lavis, Personnel Dept.,
      Ext. 3408.

In addition some firms might use a PC coordinator or PC center whose function would partially be to keep track of software applications and to maintain copies of documentation.

II. SELECTING MAINFRAME OR PC

* Amount of data to be processed - The mainframe is best suited for handling large amounts of data. It is designed for batch processing.
* Is data already being maintained on mainframe? (Don't pay two departments for entering the same data — stick with the mainframe.)
* Is the applications one that is useful to only one division or department? (Use the PC.)
* Security - Mainframe protects data with passwords and other devices — micros have far fewer controls.
* Cost - A large heavily loaded computer running TSO costs five users approximately $500,000 for incremental hardware. The same five users get faster response for $25,000 plus printer!
* Availability - Frequently computer time is scarce on the mainframe. A low priority project may wait three years to be computerized in some companies! The relative low cost of PC's and their portability make them very convenient for use out in the field as well as in the office.
* Software - The microcomputer's CP/M, MS/DOS and P systems are easier to use that TSO or

MICRO USES: { Word processing
                     { Small data base or two
                     { Small mail merge systems
                     { Spread sheet analysis
                     { Report generations
                     { As a terminal for large mainframe

MAINFRAME USES: { Large amounts of data
                     { Complex data – professional programmer
                                       needed
                     { Maintenance of data over long periods–
                       DP usually does this

DOCUMENTATION

Software Packages like Lotus 1-2-3 or Visicalc require the use of formulas. It is very important that the user record the formulas employed in applying these packages. When a printout is made of a Lotus 1-2-3 spread sheet, another printout of the formulas used to arrive at the figures should be attached. Without this kind of documentation reports cannot be replicated or compared.

Documentation is also necessary when programming a software application for the microcomputer.

HUMAN RELATIONS

Human relations becomes a factor in PC implementation in three major areas:

> Computer Anxiety
> Role Changing
> Maintaining Productivity

I. COMPUTER ANXIETY - can be the underlying culprit when management in some departments is slow to implement a microcomputer program. Anxiety occurs at all level, from president through file clerk. This anxiety is very real and must be dealt with before the individual can become a productive user. There are many reasons for this anxiety including fear of making mistakes, fear of using a new technology and not surprisingly, a fear of the keyboard. Well designed training programs are the very best weapon for combatting this phenomenon.

Computer anxiety must be dealt with in the first 20 minutes of a class. A relaxed accepting attitude toward errors, and keyboarding skills when laced with a little humor does a great deal to dispel inordinate concern.

The power of effective training in bringing about attitude change was illustrated recently in a large well known company. A group of managers were very resistant to bringing PC's into their department until they attended a two day literacy program. Following this training these individuals were among the most vocal in recommending the use of PC's. In addition, they reported a 70% time saving when using Visicalc in some areas of their jobs.

II. ROLE CHANGES - An over zealous response to computers can bring problems of another sort. A manager enamored with the versatility of Wordstar may stop giving his secretary reports to type, preferring to do it himself on the computer. Obviously this may be threatening to the secretary and this change in roles should be frankly discussed. An equally serious situation arises when a manager becomes so enthusiastic about applying the computer to his job that he spends a disproportionate amount of time programming. The corporation ends up with a $65,000 a year financial analyst doing the work of a $25,000 a year programmer.

The first individual in the department with a desk top computer may also pose a problem. His production of spectacular reports with graphs and detailed statistical back up may threaten his boss. The superior may feel that his subordinate is "out to get the boss' job".

III. MAINTAINING PRODUCTIVITY - The rationale for introducing micros into an organization is that they can do the work faster, better and more cheaply. In order to maintain these positive attributes of PC implementation it is essential to plan ahead. What will staff members be doing with the time saved by the computer? The time will be filled with something. It is management's job to be sure that the time is job oriented, not devoted to long lunch hours or crossword puzzles.

CONTROL

The issue of control is perhpas the most important of all. Your organization has been vastly changed. It now has many information managers spread through many departments. No longer is the information management function isolated in a single department.

What needs control?

I.   APPLICATIONS: What applications are being assigned to the microcomputer? How do these relate to mainframe functions?
II. DATA: What happens to data generated on the microcomputer? Who sees the results?
III. SOFTWARE: Are different programs being purchased for the same application in different departments? This will result in incompatibility of DATA.
IV. HARDWARE: Is your equipment compatible? What about operating systems?
V.   PEOPLE: Who has access to the microcomputers? Who is responsible for the equipment?

Controls result from your policies. Policies that are established by management will provide answers to the above concerns. Management must be aware of these concerns first and then must have the proper guidance to establish these policies.

The establishment of a suitable policy is only one half of control. The other half is a mechanism to implement and monitor policies once they have been established. This can be accomplished through a PC GROUP. This group of individuals should be given the responsibility of: monitoring the usage of microcomputer, providing effective communication throughout the organization about the microcomputers and providing user support through training and trouble shooting.

Tools which are useful in maintaining effective control include:

The Log: The use of a log when microcomputers are shared by several users can provide information about who the users are, what the PC is being used for, what software packages are being employed, and which data disks are handled and when.

A PC Newsletter: Useful for communicating PC guidelines and programming tips, the newsletter is also a vehicle for publicizing software applications

A Documentation Library: The PC group should require that software documentation be filed with them.

CHANGE AGENT:

The microcomputer is a change agent. It has forced us to become involved with the technology and associated issues. A major executive challenge of today is to keep track of and maintain control over information flow within our company.Understanding the microcomputer in both technical and human terms will help us to do just that.

Some Considerations with the Introduction of the
Personal Computer

Human Aspects:

*   Modifying concerns over employee obsolescence

*   Allaying fear of job loss

*   Facing concern over job downgrading

*   Realigning organizational control of information

*   Reviewing the interface between Data Processing and
    P.C. users

*   Using the expanded availability of information

*   Reacting to the immediacy of information availability

*   Controlling the demand for more imformation by P.C.
    users

*   Reorganizing the office to use electronic mail and
    communication

*   Introducing upper management to the use of the new
    technology

*   Introducing training in the new technology

Security of Information:

*   Controlling access to the corporate database

*   Controlling loss of data on individual P.C.

*   Using passwords and locks

Control:

*   Restricting unauthorized access to data

*   Organizing for standardization in use of P.C.

*   Organizing for information management

Expanded Horizons:

*   Identifying new uses for and applications on the P.C.

*   Disseminating new application

*   Training and assisting users

GLOSSARY

ALPHANUMERIC DATA is data that is made up of letters, digits, and special characters.

BACKUP refers to the creation of an identical copy of a disk or a file. Since disks can be lost or can fail during use, it is essential that all important disks or files be 'backed up.'

BOOT refers to the leading of disk. This term embraces what was once several computer loading operations - the loading of the operating system, the language, the editor and the program. Microcomputers have simplified this operation, but the term hangs on.

BINARY - this means 2. It is the basis for design of digital computers and refers to information or software in machine readable form.

BIT - smallest component in binary code. A bit is a single Binary digit in a Binary number. (0 or 1) BIT stands for Binary digIT.

BYTE is the smallest complete unit of computer memory. It is often used interchangeably with the term alphanumeric character; that is, an alphanumeric character occupies one byte of memory.

CENTRAL PROCESSING UNIT is the primary calculating and decision making unit. In a computer like the IBM P.C., the CPU is actually one powerful chip. It is the computer's 'brain.'

CRASH refers to the complete malfunction of your computer. Originally, the term meant that the head in the disk drive had literally crashed into the diskette damaging both the diskette and the head, but now the term has now become a generic term for any major breakdown.

CAD - Computer Aided Design - graphic representation of architechural, electrical, mechanical, etc. designs.

CAM - Computer Aided Manufacturing systems such as numerical control, robotics, process control

CHIP - Miniaturized Electronic Circuits - A chip contains a few
to hundreds of thousands of transistors (on/off switches) set on
a slice of silicon by means of microphotography.

        Z80 is 8 Bit (CPM) (Zilog)
        Z8000 is 16 Bit
        6800 is 8 Bit (Motorola)
        68000 is 16 Bit
        8080 is 8 Bit (Intel)
        8088 is 16 Bit (used by IBM)

CRT or Cathode Ray Tube is the visual display or television-like
tube that represents one type of computer output.

DAISY WHEEL PRINTER is a non-graphic, alphanumeric printer that
has a removable wheel with a set of spokes, each containing a
raised character that is struck by a hammer when in the print
position.

DATA BASE is the organization of information into fields,
records, and files for computer retrieval, processing and
storage.

DATA ELEMENT - smallest unit of data that can be defined (name,
address, amount due, gross pay).

DEFAULT refers to something that the computer assumes unless you
tell it otherwise, The IMB P.C. always defaults to disk drive A
when the machine is turned on.

DIP SWITCH - Toggle switches in device that set different
operating conditions.

DOCUMENTATION is the printed description and factual information
used to explain and reference a software program or a project.

DOT-MATRIX refers to a particular type of character printing
which represents alphanumeric characters by a series of dots
printed by a matrix of pins.

ELECTRONIC MAIL refers to a growing trend toward the transmission
of information between computers via telephone lines.

ELECTRONIC SPREADSHEET refers to software programs which
manipulate any type of data into rows and columns.

ERGONOMICS is the scientific study of interfacing machines and
man.   This field has provided us with improved keyboards, better
CRT screens, and machinery that fits well in the hands of
computer users.

FIELD is a single data item found within a record.   A field is a
part of a record.

FILE is a group of records. (e.g. all employees in a payroll file)

FIRMWARE is software written permanently or semi-permanently into a hardware unit like a chip.

FIXED DISK is a large, unbendable version of a diskette, housed in a protective disk unit, from which generally it is never removed. Fixed or hard disk is faster, more reliable, and has a much larger storage capacity than does a floppy diskette.

FLOPPY DISK is a single flexible disk covered with a magnetic material either 5 1/4 or 8 inches in diameter that is used for the saving of data and is removable from the disk drive.

FORMATTING also called 'initializing' readies a diskette to receive electronic information.

FORM FEED means to advance by one form length. Most printers have a form feed button that you press to move the paper up 11 inches or one form at a time.

GRAPHIC DISPLAY terminal can display both alphanumeric data and graphic data. There is an increasing use of graphics in business software applications. Programs like Lotus 1-2-3 generate graphic images - line graphs, bar graphs, and pie charts - from spreadsheet data.

HARDWARE is the physical equipment in a computer system; such as, the computer, related peripheral devices, tape drives, disk drives, printers and modems.

HARDCOPY is paper output. It is more desirable at times to have paper output as opposed to output that is only displayed on the CRT.

Hard disk (see fixed disk)

HEAD is the small magnetic device inside a diskette drive that reads and writes information on diskettes.

INTERFACE refers to the connecting hardware and software that is placed between two computer devices. The function of an interface is to provide compatibility between these two computer devices which would not function together when connected otherwise

INTEGRATED CIRCUITS or IC's are complex electronic circuits that are etched into silicon chips by the process of photolithography.

I/O or Input/Output Operation is the communication of data into the computer and the communication of data out of the computer.

INTERACTIVE refers to the computer and software's ability to respond to information that has been input. Most application software sold today is interactive.

KEYBOARD is the most common man-machine interface used. There is some effort to reduce the amount of keyboard-use for inputting. Devices like the 'mouse', touch screens, and the increasing use of voice recognition suggest this trend.

KILOBYTE, KB, or K means specifically 1024 bytes; generally, we use the term to mean 'thousand' and we use it in reference to an amount of memory. Thus, '128K' means that there are 128,000 bytes or spaces.

LANGUAGE, for computers, is a set of commands and syntax rules. This definition usually refers to computer languages like BASIC, COBOL, FORTRAN, and PASCAL. Recently, this definition is being applied to very general applications software packages like Visicalc and dBase II since these general purpose software packages create their own unique programming languages.

LINE FEED means to advance by one line. Most printers have a line feed button that you press to move the paper up by one line.

LINE PRINTER is a high-speed printer capable of printing an entire line at a time. Used with large, time-shared computers rather than individual personal computers.

LOGGED DRIVE is another term for default drive.

MAINFRAME computers are large computers which are capable of processing large amounts of data at very fast speeds with access to billions of characters of data. These are the largest and the most powerful of the computers. One of the first and most famous electronic digital mainframe computers was ENIAC built in 1946 at the Moore School of Electrical Engineering in Pennsylvania.

MEMORY refers to the part of computer hardware which remembers data. There are several types of memory which are available. There is permanent memory which contains data and information that is always available - whether the computer is on or off. There is also temporary memory which contains data too, but which loses its data the moment the power is turned off.

MENU driven refers to a type of program application which presents the user with a selection of choices.

MICROCOMPUTER is the smallest and the least expensive class of computer. The role of the microcomputer is growing in importance in the business world due to technology's ability to squeeze more computer capability into a smaller machine and also the ability of the microcomputer to communicate with large mainframe machines.

MNEMONICS is the symbolic name assigned to program (e.g. ytdgrpay for year-to-date gross pay)

MODEM is a device that permits a computer to communicate with other computers in remote locations via telecommunication lines.

NETWORK is a computer system using data communications equipment to connect two or more computers.

OPERATING SYSTEM is a set of programs that allows the computer system to manage its own resources. The operating system directs the fundamental operations of the computer. Ultimately, the operating system gives user control of the computer by defining a way that hardware, software and the user all interact.

PERIPHERAL device is any device that a computer will operate but which is not essential for normal computer operation.

PLOTTER is a machine that produces hard copy output in the form of maps, drawing, charts, and so on in two or three dimensions. A plotter is distinguished from a printer by how it produces the image on the paper and its speed. Generally, printers are used for text output and plotters are used for graphic output.

PRODUCTIVITY or Applications software is any software designed to solve specific business problems.

RAM or Random Access Memory - information can be transferred in and out of these chips and is not permanent.

READ a diskette means to copy information from a diskette into the computer's memory. You can't use the information stored on a diskette until it has been read into memory.

RECORD is a collection of related fields or data items. A record is part of a file.

RESPONSE TIME is the interval between your telling the computer to do something and its acting on your instructions. The less time the better.

ROBOT is any device which stores one or more programs and which is capable of affecting, altering or changing its environment.

ROM or Read Only Memory is permanent memory storage for computer instructions (Firmware).

SOFT COPY is temporary output, such as that which is produces on a CRT screen. The advantage of soft copy is that it conveys information and yet is easily disposed.

SOFTWARE is an instruction or set of instructions in a computer which manipulates the activity of that computer in a highly defined way. Software generally is placed into computer memory by keyboard inputs, loaded from disk or tape or can be transferred from firmware chips.

TELECOMMUNICATIONS refers to use of telephone communication technology in conjunction with computer technology to form a national or international network of linked computers which can exchange data or information very rapidly. As application software like VisiCalc put personal computers in businesses throughout America, telecommunications may be the force that puts computers in most homes.

TELECOMMUTING refers to the substitution of computers and telecommunications for the long commute to work. Thus, it will be possible for some workers to remain at home and yet perform on-the-job-activities.

USER FRIENDLY refers to computers, computer software, and/or computer systems which are simple and logical to use and therefore require less training to master.

UTILITY refers to software used to make working with the computer much easier. the IBM P.C. comes with a DOS diskette that contains programs which permit you to perform necessary operations like copying entire disks, checking the integrity of a disk's surface and comparing the contents of two diskettes.

VOICE RECOGNITION refers to the increasing ability of computers to accept voice commands as computer input.

WINDOWING is a process which permits the user to view simultaneously different portions of a picture on the terminal screen.

WRITE to a diskette refers to the copying of information onto a diskette and keeping a permanent copy on diskette for future use - the computer's memory is only temporary

WORD PROCESSING refers to the inputting, processing and formatting of information for text output.

COMMUNICATION

The next major thrust in the growth in the use of microcomputers is now emerging. This is the advent of networking. Networking is the ability to link various micros together and to a mainframe. The technology to accomplish this is rapidly evolving to the point of becoming readily accessible from a cost and flexibility point of view. This means that diverse makes of computers can be linked over greater distances.

LAN - (local area networks) is the term applied to this procedure. It differs from wide area networks in that it is confined to one office, one building, or a limited geographical area such as a school campus. LANs depend on wire connections so that each device plugs into the line. The unique aspect of this network is the means for converting signals into digital form for transmission and controlling the access to the lines by each user. A traffic cop (multiplexor) is needed to monitor transmission (protocol) to insure proper flow and direction of data as well as integrity of each message. This procedure has given impetus to the "office of the future" in that communication and data storage are on the computer terminals, drastically reducing paperwork generation and filing.

Another essential facet of communication that had long (a relative term if only a few years) been with us is the Modem. This enables a computer to link up to an information source via telephone lines. These information sources (data bases) are proliferating in every field and profession. It is simplifying the work of the lawyer, doctor, stock analyst, finance manager, scholar or anyone who might need to research data to evaluate problems. In addition it makes the salesman's lot easier in transmitting orders to the home office, simplifying the clerical task of receiving and entering orders. The portable computer connected to a modem is making communication a rapidly expanding process. Consideration should be given to the type of modem selected based on the many features included. (Duplex, auto answer and auto dial, acoustic coupling, speed of transmission-300 to 2400 baud). Speed of transmission is a serious consideration when large volumes of data are to be transmitted. The phone bills could be high. By the way - 300 baud means 300 bits per second or about 30 characters/sec which is equivalent to about 30 words/min. Frequently used terms in data transmission are Synchronous and Asynchronous. The former means that the data is transmitted in a manner where the sender is synchronized with the receiver. Transmission is faster. In the latter, the sender is not timed with the receiver and therefore there must be start and stop signals (bits) in every batch transmitted, thus slowing up the process.

A key element in networking is the multiplexors or traffic cops. These units monitor the flow of messages and control the access to the cables from each terminal. The more terminals in the

system, the more important this control becomes. Some multiplexors will assign transmission space based on frequency of use, or time allocation or possible different frequencies to assure efficient use of the transmission lines.

One of the offshoots of the growth in communication technology is the use of telecommuting. Imagine if you could have your terminal at home and have it connected to the office for instant communication. Over 250 companies are now doing this ranging from 1 to 100+ employees working in their homes. Productivity is estimated to be about 30% greater. Unless you are learning something on the way to work, or sleeping if you prefer, most commuting is lost time.

Communication has an underlying assumption – the ability to interface (talk to) with the main computer. This step opens a host of considerations in terms of availability of information to more users, security of data, in terms of loss, misuse, restricted access, etc. A whole new organizational aspect is evolving in terms of "Information Management". Decisions must be made on who is responsible for defining the needs for company information. Does the project engineer have access to detailed corporate budget data to plug into his spread sheet program when he calculates ROI or is this a Finanace function? Who has office automation responsibility when micros and modems becomes so inexpensive that their cost can be buried in departmental expenses by various users. Who is responsible for coordinating the generation of data bases at various departmental levels particularly when data does not agree with central computer information. Is MIS the responsible source or another coordinating body? There are many questions and answers are only now being evolved as experience is gained with the expanding use of the new technology.

It is most important to be aware of the implications of microcomputer, communications and the rapidly expanding technology so reasonable judgement can be used in adapting the the trends.

THE CARE AND FEEDING OF DISKETTES

If treated properly a diskette will last a substantial period of time. It is imperative that diskettes containing important information be backed up frequently. Very simply, backing up diskettes should be part of the normal routine for using the computer.

It is not important to know how data is actually recorded on a diskette, but some knowledge about diskettes will be very useful. Microcomputers use either single or double sided disk drives and thus use single or double sided disks according to the drive type. The diskettes vary in the amount of data that they can store. Some diskettes are single density while others are double density and hold about twice as much data.

Regarding the handling of diskettes, there are certain DOs and DON'Ts which must be followed.

* Do write-protect diskettes that contain important information by covering the notch on the side of the disk.

* Do label diskettes for easy reference.

* Do backup important disks immediately.

* Do clean the disk drive on a regular basis with a cleaning kit.

* Don't touch the exposes surfaces of a diskette.

* Don't fold a diskette. They may flop, but they don't fold.

* Don't write on the label of the diskettes with a sharp pencil or ballpoint pen.

* Don't expose the diskette to any magnetic device. It may affect or erase part of the data on the diskette.

* Don't leave diskettes in dusty areas. This will dramatically shorten the disk life.

* Don't leave disks in very cold or very warm places.

THE FLOPPY DISK

Protective jacket is permanent — don't try to extract the diskette from it.

Exposed recording surface

Head slot

Manufacturer's label

Write protect notch

Your label
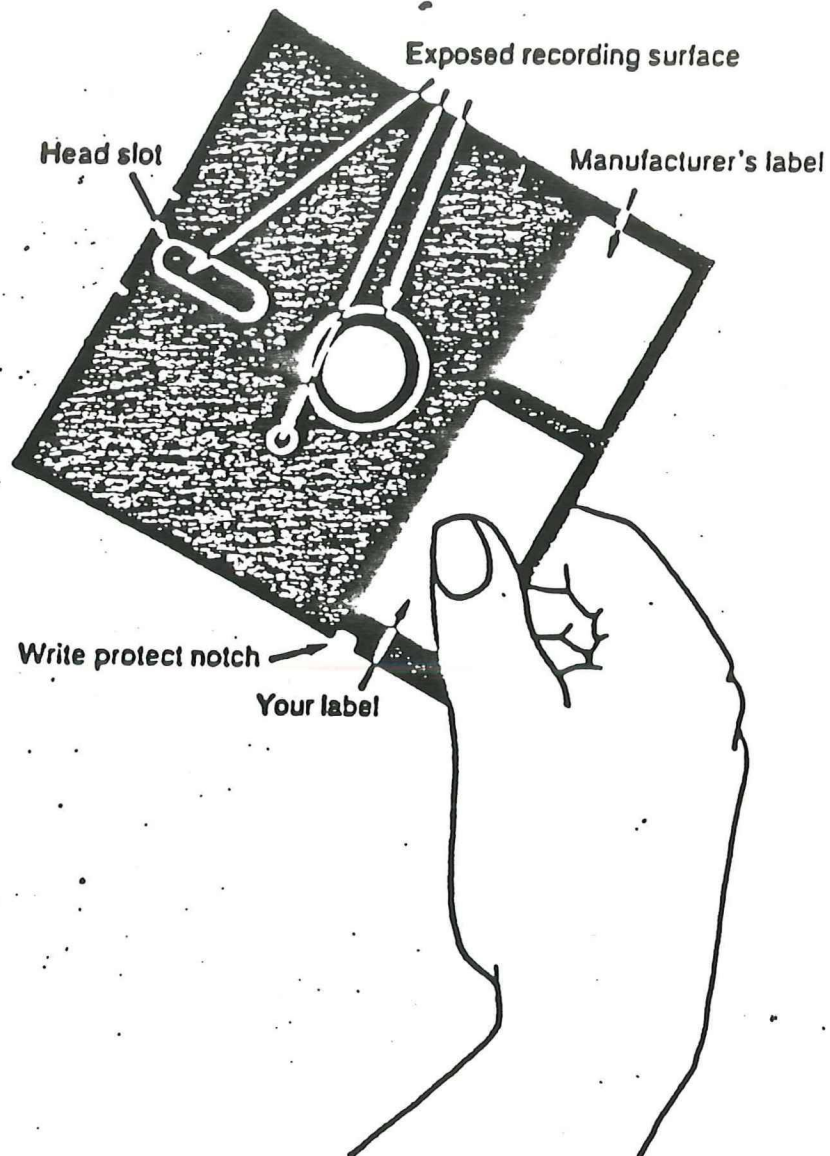
Overview: Software refers to step-by-step instructions that tell a computer what to do and how to do it. Those step-by-step instructions are called a *program*.

Today there are hundreds of different kinds of commercially available programs, called applications software. Programs that drill students on basic number facts, help balance a checkbook, or turn the computer into a word processing (or text editing) terminal are three examples of applications software.

These programs are stored outside the computer in one of two basic ways: on an ordinary audio cassette tape, or on what is known as a floppy disk. The illustrations on this page provide a detailed look at a floppy disk.

(a) Label

(b) Write/Protect Notch —When notch is opened (uncovered), information can be written to (or stored on) the disk. When notch is closed (or covered with special tape), information can only be read from the disk.

(d) Head Access Opening— The disk drive's read/write head touches the floppy disk here, as the disk spins inside the disk drive. The head reads information from the disk or writes information to the disk.

(e) Index Hole—Used by some computers to tell where sectors start.

(c) Drive Spindle Hole: The disk drive attaches to the floppy disk here.

Fig. 1: *A floppy disk looks like a paper-thin 45 RPM record, encased in a square protective cover.*

Fig. 2A Floppy Disk Track

Fig. 2B Floppy Disk Sector
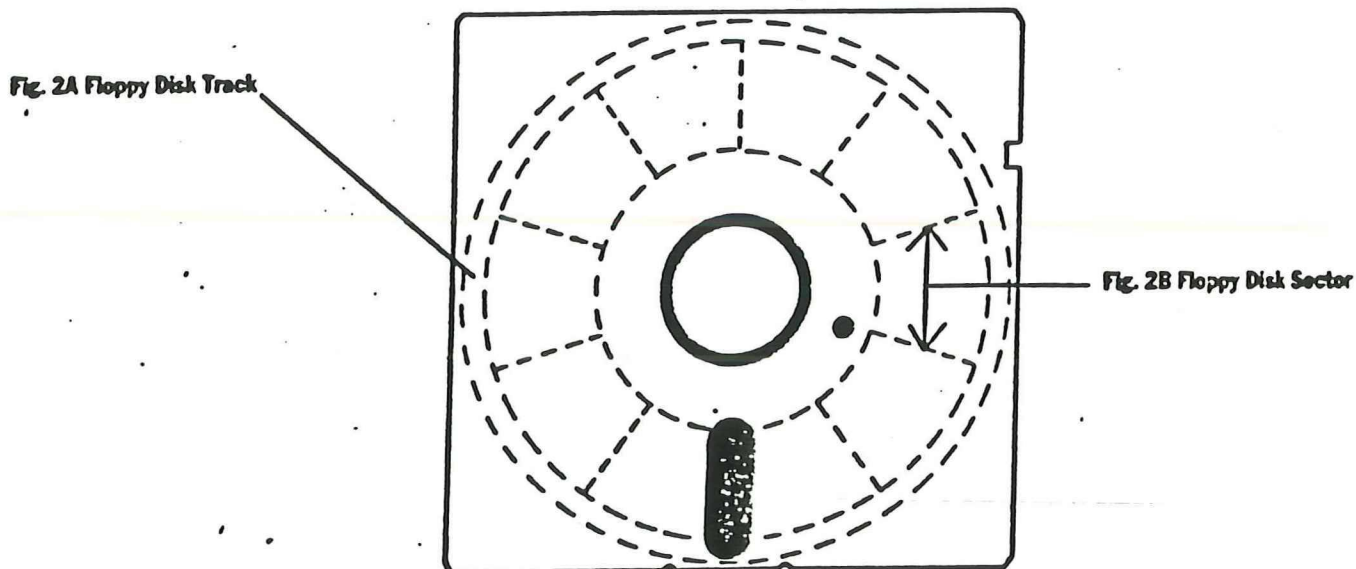
Fig. 2: *"Inside" a floppy disk.*

Inside the protective covering of a floppy disk (*Fig. 2*) is a thin, round piece of plastic that stores data magnetically—in much the same way that cassette tapes store music. This piece of plastic is divided into circular tracks, which are further divided into sections or sectors, neither of which you can actually see (*Fig. 2A and B*).

A typical "double density" floppy disk consists of 40 tracks and 10 sectors. Each sector of the double density disk can store 512 bytes of information, for a total of 5,120 bytes per track, and 204,800 bytes per disk. (A byte is a single unit of information, usually a letter, number or symbol.) That's the equivalent of about 60 single-spaced typewritten pages.

* The Mainframe

Between 1937 and 1944 Howard Aiken, financially supported by IBM and the U.S. Navy, worked to complete the Automatic Sequence Controlled Calculator, an electromechanical computer/calculator that was capable of multiplying two 10-digit numbers in less than 10 seconds. As impressive as the calculating powers of Aiken's invention, nicknamed Mark, were its dimensions: the machine was the size of a two-car garage, it contained over 750,000 parts, and it had over 500 miles of electrical wire.

The desire for a machine with greater speed of calculation led John Mauchly and Prosper Eckert to complete the development of the Electronic Numeric Integrator and Calculator (ENIAC) in 1946. This computer, financed by the U.S. Army, had several unique distinctions: it was the first general-purpose digital computer, and because it used vacuum tubes rather than relay switches, it had no moving parts. The operational speed of ENIAC was considerably faster; it could add 5,000 numbers in one second. The dimensions of ENIAC were as astonishing as those of Mark I: 18,000 vacuum tubes, weight – 30 tons, height – 10 feet, width – 3 feet, length – 100 feet. ENIAC was out of operation every other day merely due to the tremendous heat generated by the 18,000 vacuum tubes.

Subsequent to the completion of ENIAC, Mauchly and Eckert applied the notable work of John von Neumann to their second project, UNIVAC. Von Neumann had devised the means by which a computer could store not only the data necessary for problem-solving but also the instructions for such problem-solving. Mauchly and Eckert utilized von Neumann's stored-program machine prototype as the guidelines for their construction of the first universal, all-purpose, electronic computer, UNIVAC. Whereas UNIVAC was not built specifically for government projects, it was a breakthrough into the business world and is thought to be the immediate forerunner of the mainframe computer.

The entry of the computer into the business world was answered favorably by IBM, Bell Telephone, and Sperry-Rand undertaking the design of computers for the marketplace. The development of the transistor by Bell Laboratories in 1948 and its refinement through the early 1950's led to the manufacture of mainframes and the sale of those computers to large institutions.

* The Minicomputer

Digital Equipment Corporation (DEC) produced the firs
processing unit known as a minicomputer. The motivation
behind the development of the minicomputer was to provide a
computer that would fulfill the needs of smaller companies
that did not require the tremendous number-crunching
capabilities of the mainframes. Typically, a minicomputer
costs between $15,000 and $75,000. As it is distinguished
from a mainframe by its smaller size and its ability to be
powered by a standard electrical current, the minicomputer
can be differentiated from the microcomputer in terms of
having a greater memory, faster operational powers, and the
ability to support more peripheral devices (telephone
modems, printers, etc.) simultaneously.

* The Microcomputer

Just as the development of the transistor allowed the
development of computers much more efficient than those
that had relied on vacuum tubes, the miniaturization --
ultimately, the "micro-miniaturization" -- of the
transistor paved the way to the extreme small size : large
memory ratio of the present microcomputers. The
microprocessor introduced by the Intel Corporation in 1971
had 2,250 transistors in a 1/16-inch by 1/8-inch chip, and
it had more computing power than its its predecessor,
ENIAC.

The microprocessor has been responsible for the development
of the microcomputer. And the evidenced potential (cum
reality) of the microcomputer's applicability resulted in
the extremely rapid shift from cottage industries to high-
level corporate involvement: in terms of manufacture,
marketing, support, and application.

Especially the Memory

The data and the programs entered into a microcomputer -- and so into the microprocessor -- are entered in the binary number system (the base-2 number system of which the only two digits are 1 and 0). Each binary digit is known as a bit. These bits are combined into larger units referred to as bytes. The byte is the "word" composed of consecutive bits which the computer treats as a single unit of data. Microcomputers are commonly noted for having 64K or 128K or 256K memory. Those numbers reflect the numbers (in thousands in the binary system: 210 or 1,024) of bytes of memory space in the computer. A computer with 256K bytes of memory has a memory system capable of storing 262,144 bytes of memory, or 2,097,152 bits.

Typically, a microcomputer has memory in the range of 32K to 256K bytes. Minicomputers may contain between 256K and 10 megabytes of memory. Mainframe computers range up to and beyond 50 megabyte main memory systems.

As technology has advanced, the standard size of the byte has increased. Originally, microcomputers were built with 8-bit microchips. This meant that the largest number of bits that could be handled at one time and stored in any one place in the computer's memory was 8 (or that a byte could be no longer than 8 bits long). The development of more powerful microchips resulted in 16-bit and 32-bit chips and microprocessors. Essentially, the size of the microchip has not changed; its capacity for storing bits of data has increased. As a result a computer with 16-bit capacity operates faster and has larger memory than an 8-bit computer. Similarly, a 32-bit machine surpasses the 16-bit computer. The main memory of a computer is reliant upon the previously mentioned microchip. Data that is input to the microcomputer is stored on the relevant microchip(s). The CPU directs the flow of the input to the appropriate chips for storage.

RAM and ROM

The main memory of a microcomputer is of two kinds: Read Only Memory (ROM) and Random Access Memory (RAM). The former memory is permanent, was programmed onto the specific ROM microchips at manufacture, and is not affected by loss of electric power to the computer. Read Only Memory includes such functions as arithmetic calculations and systems commands and logical operations that are always present in the computer.

The latter memory, RAM, is exactly the opposite. RAM is temporary memory, it^{a)} stores data that is input for the

program currently on board, and it is erased by loss of power to the computer. RAM may be thought of as "reusable" memory space, or better still as a blackboard upon which information may be written temporarily and easily erased when new information is to be written. Because the RAM chips do not retain the data stored on them when the power is removed, RAM memory is "volatile".

THE NEED FOR ADDITIONAL MEMORY

Based on what we have just learned about memory, we can see the need for having an alternative method of storing data. The main memory of the computer is just too small to store all of our data, and it's volatile nature does not allow for permanent storage. Therefore it is necessary for a computer system to have alternative methods of storage. The most common methods are tape and disk with disk being the prefered method on the microcomputer.

There are two types of disk systems, floppy and hard disk. The most obvious difference between the two is the fact that floppies can be put into and removed from the computer at will, compared with the hard disk which is permanently fixed in the computer. Hard disks are called "fixed disks" for that very reason. A more significant difference between disks is the amount of data which they can store. A floppy can store approximately 320K on it while the hard disk can store 10 megabytes or more.

Floppy disks, more commonly called diskettes, come in a variety of formats. For example, you can get single or double sided disks which can be single or double density, with or without hubs. A single sided double density diskette can store slightly more than 160K. The double sided ones store twice that with a capacity of over 320k. The quality of the diskette is a major concern. Your data are extremely valuable and it is not cost effective to save on the price of the disks and have to spend additional time entering data which were lost due to the poor quality of the disks.

The peripheral which transfers this data between disk and computer is the disk drive. The floppy drives can be either single or double sided. Early computers were equipped with single drives; however today, double-sided drives are the rule. Many of the more sophisticated software programs require a double sided drive and double sided drives can store twice the data as single sided drives. Interestingly, the drives of a computer are the components most need of maintenance. The head of the drive, the device which transfers the data, can become misaligned thus causing errors in the transfer process. In addition,

if the speed of the drive is incorrect, errors will result. For more specifics on disks and disk drives, please refer to Appendix Three.

COMPLETING THE COMPUTER SYSTEM

Besides the disk drives, there are two other types of peripherals which make up the typical computer system. The first are devices which permit communication between computers. We are all familiar with the concept of the Electronic Office where computers are "talking" to other computers and word processors through a networking system. This results in increased communication speed and productivity. The technology to accomplish this is rapidly evolving. Currently, there are two major methods of "connecting computers. They are the LAN (Local Area Network), and the MODEM (Modulator, Demodulator).

The Local Area Network is a physical connection among several computers. A cable is used for the connection. This type of communication requires an additional device to monitor the flow of data. This device is called a mulitplexor.

The MODEM enables a computer to link up to an information source via telephone lines. This information source can be another microcomputer or it can be a mainframe system. There are a number of public information sources, (databases) which can be utilized with the proper equipment. A number of hardware and software devices are available to allow you to facilitate the communication process. The linking of computers via MODEMS and existing communications networks will enable more work to be done at home or away from the office. A good example is the simplification of the salesmen's task in transmitting orders to the home office.

PRINTERS comprise the second category. These devices provide us with the hard copy of computer data. Printers produce characters in a number of ways. We are all familiar with the print out from dot matrix printers and letter quality printers. In the former instance the characters are formed from a series of dots while in the latter case a character imprint is made on the paper. Dot matrix printers are more versatile and faster than the letter quality printer, but are less satisfactory for correspondence. Graphic output is the result of modifications to dot matrix printers or from plotters designed specifically for that purpose.

Binary Code:

Digital Infomation Code; Binary Code is the fundamental principle behind digital computer design. All information (and instructions) is converted into binary numbers made up of the two binary digits 0 and 1 (bits). For example: When you depress the "A" key on your ASCII terminal, the terminal automatically generates a one-byte binary number (01000001) which it stores as a pattern of electric charges in its memory cells (1 bit=charge, 0 bit=no charge). It then transmits this bit pattern as a pattern of electric impulses to the computer. Each bit is a duration of time (tiny fractions of a second). In that duration, either a pulse of electricity or light (representing the 1 bit) or no pulse (representing the 0 bit) is generated and transmitted. The computer (set at the same pulse rate as the terminal) accepts these patterms of pulses and stores them as patterns of bits in its memory.

Information and instructions on magnetic tape and disk are represented as patterns of magnetic spots. We see the real characters on our terminals and printers because these devices convert the binary patterns to real letters and numbers.

The electronic circuits that process these binary codes are themselves binary in concept: they are made up of on/off switches which are electrically opened and closed. The switch itself is a transistor. The current flowing through one switch effects the operation of another switch, and so on. These switches open and close in nanoseconds and picoseconds (billionths and trillionths of a second). The switch patterns are designed to detect and manipulate binary pulses according to the rules of boolean logic.

The binary concept is helpful for developing faster computers. We concentrate on improving the electronic circuits that store and transmit the bit. Greater storage capacities are achieved by making the storage cell or magnetic spot smaller. Faster transmission rates are achieved by shortening the time it takes to open or close an electronic switch and developing circuit paths that can handle the increased speeds. We simply continue to refine the binary concept.

How binary numbers work:

Binary numbers are not difficult. You can even have "math phobia" and still understand how the binary method works in computers.

Binary means 2. Binary numbers work with only 2 digits, 0 and 1, instead of the ten digits, 0 thru 9, in our decimal numbering system (decimal means 10). One difference between binary and

decimal is that we have to "carry" more often in binary.

When you add 9 and 1 in decimal, you have a result of 0 and a carry of 1. The 1 belongs in a new place to the left of the 0:

$$\begin{array}{r} 9 \\ +1 \\ \hline 10 \end{array}$$

Now follow counting to 10 by 1 in both binary and decimal. Note how the binary method has many more carries than the decimal method, In binary, 1 and 1 are 0 with a carry of 1:

Binary	Decimal
0	0
+1	+1
1	1
+1	+1
10	2
+1	+1
11	3
+1	+1
100	4
+1	+1
101	5
+1	+1
110	6
+1	+1
111	7
+1	+1
1000	8
+1	+1
1001	9
+1	+1
1010	10

Study this carefully. If you have difficulty, put it down and try again (some other time).

Binary is used in computers because it is the simplest method there is for representing data electronically. A pulse is either present or absent. It's much easier to build complicated electronic circuits when their primary operation is just the detection of the presence or absence or current.

1-2-3 Commands

/Worksheet Commands

Global	Overall worksheet settings
Format	Number/Formula display
Label-Prefix	Alignment of labels
Column-Width	1-72 characters
Recalculation	Formula recalculation procedures
Protection	Enable/Disable cell protection
Default	Standards for printing, current disk
Insert	Create empty rows/columns
Delete	Eliminate rows/columns
Column-Width	1-72 characters
Erase	Erase worksheet and settings
Titles	Freeze rows/columns onscreen
Window	Split/Unsplit display window
Status	Display global settings

/Range Commands

Format	Number/Formula display
Label-Prefix	Alignment of labels
Erase	Erase cell entries
Name	Maintain set of names for ranges
Justify	Adjust width of label "paragraph"
Protect	Disallow changes to cells (if Protection Enabled)
Unprotect	Allow changes to cells
Input	Restrict pointer to unprotected cells

/Copy Command

Copy entries to new location(s)

/Move Command

Move entries to new location

/File Commands

Save	Store entire worksheet in *worksheet file*
Retrieve	Restore data from *worksheet file*
Combine	Incorporate (part of) *worksheet file* into current worksheet: methods: Copy, Add, Subtract use Entire-File or Named-Range only

/File Commands (continued)

Xtract	Store range of entries in worksheet file: save Formulas or current Values only
Erase	Erase one or more 1-2-3 datafiles
List	List names of 1-2-3 datafiles, report disk space
Import	Incorporate *print file* into worksheet: treat lines as Text or as Numbers and quoted text
Directory	Change *current directory* assignment

/Print Commands

Printer vs. File	Direct output to printer or *print file*
Range	Range to be printed
Line	Advance printer one line
Page	Advance to top of next page
Options	Page formatting
Header, Footer	Set page header/footer line
Margins	Left, Right, Top, Bottom
Borders	Graft extra columns/rows to print Range
Setup	Set printer-control characters
Page-Length	Set number of lines
Other	As-Displayed vs. Cell-Formulas: Printing of formula texts Unformatted vs. Formatted: Suppress headers, footers, page breaks
Clear	Cancel print settings
Align	Reset line-number counter to 1
Go	Print the selected range

/Graph Commands

Type	Select graph type
X A B C D E F	Set graph data ranges
Reset	Cancel graph settings
View	Display graph
Save	Save graph image in *graph file* (.PIC)
Options	
Legend	Enter graph legends (A–F)
Format	Set method of displaying Line and XY data: Lines, Symbols, Both, Neither
Titles	Enter title text: axes, graph
Grid	Overlay with horizontal/vertical lines
Scale	Set/Format numeric axis scales
Color vs. B&W	Display method
Data-Labels	Range of entries to label data points
Name	Maintain set of names for groups of graph settings: Create, Use, Delete, Reset

/Data Commands

Fill	Enter number series in a range
Table	Tabulate formula values as *Input* entries vary
Sort	Sort data records
Data-Range	Set range to sort
Primary-Key	Set first column to sort on
Secondary-Key	Set second ("tiebreaker") column to sort on
Reset	Cancel sort settings
Go	Perform the sort
Query	Select data records from a database
Input	Range containing database
Criterion	Range containing record-selection criteria
Output	Range to receive copies of records
Find	Highlight selected records (Input, Criterion ranges required)
Extract	Make (partial) copies of selected records (Input, Criterion, Output ranges required)
Unique	Make (partial) copies of selected records — no duplicate copies (Input, Criterion, Output ranges required)
Delete	Delete selected records (Input, Criterion ranges required)
Reset	Cancel query settings
Distribution	Calculate frequency distribution

/Quit Command

End 1-2-3 session (Be sure to save your work first!)

PrintGraph Commands

Select	Select graphs to print
Options	Formatting options
Color	Colors for parts of graphs:
Grid	Gridwork and text
A B C D E F	Data range (A – F):
	Available colors displayed
Font	Type fonts:
1	Font for first line
2	Font for rest of graph (if omitted, Font 1 used)
Size	Size and placement of graph
Full vs. Half	One or two graphs per page
Manual	Adjust size settings manually:
Left, Top	Margin
Width, Height	Overall dimensions
Rotation	Clockwise rotation of image
Pause	Pause between printing graphs
Eject	Page eject between printing graphs
Go	Print the selected graphs
Configure	Configure PrintGraph to system hardware
Files	Directories to search for data files
Pictures	Directory to search for Picture (graph) files
Fonts	Directory to search for Font files
Device	Graphics printer:
Page	Default page size
Length	Default page length
Width	Default page width
Interface	Interface for graphics device: two parallel, two serial
Save	Record configuration in GRAPH.CNF
Reset	Resets "unsaved" configuration settings to default
Align	Make current paper position "top of form"
Page	Advance paper to top of next page
Quit	End PrintGraph program

Function Keys

F1:	Help	Display Help screens — press [Esc] to return to Ready Mode
F2:	Edit	Switch to/from Edit Mode for current entry
F3:	Name	(Point Mode only) Display menu of range names
F4:	Abs	(Point Mode only) Make/Unmake cell addresses "absolute"
F5:	GoTo	Move cell pointer to a particular cell
F6:	Window	(Split-screen only) Move cell pointer to other window
F7:	Query	Repeat most recent Data Query operation
F8:	Table	Repeat most recent Data Table operation
F9:	Calc	Ready Mode: Recalculate worksheet Value and Edit Modes: Convert formula to its current value
F10:	Graph	Draw graph according to most recent graphing specifications

Names for 1-2-3 Data Files

Names assigned to 1-2-3 worksheet, print, and graph (picture) files may be at most eight characters long, and must consist of these characters only:

A B .. Z a b .. z 0 1 .. 9 _ (underscore)

Notes:

1. Uppercase and lowercase letters are equivalent.

2. Don't try to enter a filename extension. 1-2-3 automatically uses these extensions:

.WKS worksheet file
.PRN print (text) file
.PIC graph (picture) file

3. To specify a file that is not stored on the current disk (DOS 1.10) or the current directory (DOS 2.00), use a disk prefix:

C:SALESFIG   B:JAN_JUN

With DOS 2.00, specifying a disk prefix causes 1-2-3 to use the directory that was most recently made current on that disk.

Keyboard Macros — Names for Special Keys

(uppercase and lowercase letters equivalent)

Control and Editing Keys

~	[Enter] key
{Esc}	
{BS}	[Backspace] key
{Del}	
{?}	Pause to accept keystrokes until ↵ is pressed

Pointer-Movement Keys

{Up} {Down} {Left} {Right}
{Home} {End} {PgUp} {PgDn}

Function Keys

{Edit}	F2	{GoTo}	F5	{Table}	F8
{Name}	F3	{Window}	F6	{Calc}	F9
{Abs}	F4	{Query}	F7	{Graph}	F10

The /X Commands

/XLocation~   Call

Continue reading keystrokes at *location* (cell address, range, or range name). When a /XR command is encountered, return to the point just beyond the /XC location~ command.

/XR   Return

(Must follow /XC command) Return to reading keystrokes just after the corresponding /XC *location* ~ command.

/XGlocation~   Go To

Continue reading keystrokes at *location* (cell address, range, or range name). No "return" is possible.

/XIformula ~ . . .   If-Then

If the *formula* is **TRUE** (i.e. has a non-zero value), continue reading keystrokes in the same cell. If the *formula* is **FALSE** (i.e. zero), continue reading keystrokes in the cell below.

/XMlocation~   Process a Menu

Allow user to make a menu choice, and branch on the choice. 1-2-3 constructs the menu from the menu range whose upper left corner is *location* (cell address, range, or range name).

/XLmessage ~ location ~   **Label Entry**
/XNmessage ~ location ~   **Number Entry**

Display the specified *message* as a prompt in the control panel, accept an entry from the keyboard, and store the result as a left-justified label (/XL) or as a number (/XN) at *location*.

/XQ   **Quit**

End macro execution and return to Ready mode.

@ Functions

Mathematical Functions

@ABS(*x*)	Absolute value of *x*
@ACOS(*x*)	Arc cosine
@ASIN(*x*)	Arc sine
@ATAN(*x*)	2-quadrant arc tangent of *y*/*x*
@ATAN2(*x*,*y*)	4-quadrant arc tangent
@COS(*x*)	Cosine
@EXP(*x*)	Exponential
@INT(*x*)	Integer part
@LN(*x*)	Log base e
@LOG(*x*)	Log base 10
@MOD(*x*,*y*)	*x* mod *y*
@PI	π = 3.141592653589794
@RAND	Random number between 0 and 1
@ROUND(*x*,*n*)	Round number *x* to *n* decimal places
@SIN(*x*)	Sine
@SQRT(*x*)	Square root
@TAN(*x*)	Tangent

Logical Functions

When determining the truth value of a formula, 1-2-3 considers any non-zero value to be TRUE. Only 0 itself is FALSE.

@FALSE	0 (FALSE)
@TRUE	1 (TRUE)
@IF(*cond*,*x*,*y*)	*x* if *cond* is TRUE (non-zero)
	y if *cond* is FALSE (zero)
@ISNA(*x*)	1 (TRUE) if *x* = NA
@ISERR(*x*)	1 (TRUE) if *x* = ERR

Special Functions

@NA	NA (not available)
@ERR	ERR (error)

@CHOOSE(*x*,*v0*,*v1*,.., *vN*)	Select value
@HLOOKUP(*x*,*range*,*offset*)	Table lookup with index *row*
@VLOOKUP(*x*,*range*,*offset*)	Table lookup with index *column*

Financial Functions

@IRR(*guess*,*range*)	Internal rate of return
@NPV(*x*,*range*)	Net present value
@FV(*pmt*,*int*,*term*)	Future value
@PV(*pmt*,*int*,*term*)	Present value
@PMT(*prn*,*int*,*term*)	Payment

Date Functions

These functions generate the *serial numbers* by which 1-2-3 identifies days, from 1 = 01-Jan-1900 to 73049 = 31-Dec-2099. Use any of the three "date" numeric display formats to make numbers appear in date form (e.g. 30-Apr-84).

@DATE(*yr*,*mth*,*day*)	Number (1..73049) of specified day
@DAY(*yr*,*mth*,*day*)	Day (1..31) of specified day
@MONTH(*yr*,*mth*,*day*)	Month (1..12) of specified day
@YEAR(*yr*,*mth*,*day*)	Year (0..199) of specified day
@TODAY	Today's number (e.g. Nov 11, 1983 = 30631)

Statistical Functions

@COUNT(*list*)	Number of argument values
@SUM(*list*)	Sum of values
@AVG(*list*)	Average value
@MIN(*list*)	Miminum value
@MAX(*list*)	Maximum value
@STD(*list*)	Standard deviation ("N" method)
@VAR(*list*)	Variance ("N" method)

list: any number of arguments, separated by commas. Use any type of argument: number, formula, cell address, range specification, or range name.

Note: Blank cells in a range are ignored. Label entries are equivalent to the number zero.

Database Statistical Functions

These counterparts to the statistical functions operate on particular fields of records selected from a database. The selection process is exactly the same as with the /Data Query command:

@D**xxxx**(*inp_range*,*col_offset*,*crit_range*)

- The *inp_range* argument identifies the Input range — the database itself.
- The *crit_range* argument identifies the Criterion range. Together, these two ranges determine a set of selected records.
- The *col_offset* argument identifies the field (column) of the selected records to be used in the statistical analysis (leftmost field = 0).

@DCOUNT	Field count
@DSUM	Field sum
@DAVG	Field average
@DMIN	Field minimum
@DMAX	Field maximum
@DSTD	Field standard deviation ("N" method)
@DVAR	Field variance ("N" method)

Note: Blank cells in a range are ignored. Label entries are equivalent to the number zero.

Arithmetic and Logical Operators

Operations with larger precedence numbers are performed first, unless overridden by parentheses. Operations with equal precedence are performed left-to-right.

Operator	Meaning	Precedence #
^	Exponentiation	7
+	Positive	6
−	Negative	6
*	Multiplication	5
/	Division	5
+	Addition	4
−	Subtraction	4
=	Equals	3
<	Less than	3
<=	Less than or equal	3
>	Greater than	3
>=	Greater than or equal	3
<>	Not equal	3
#NOT#	Logical *not*	2
#AND#	Logical *and*	1
#OR#	Logical *or*	1

Numeric Display Formats

Each cell has a **numeric display format** that is independent of the cell's contents. In an empty worksheet, all cells have the General format.

/Worksheet Global Format: Sets global numeric format, which 1-2-3 uses for all cells not processed with a /Range Format command.

/Range Format: Changes the numeric format of all cells in a range. The /Range Format Reset command returns the cells to using the global numeric format.

General	34.007	− 689.123
	(as many decimal places as needed)	
Fixed	34.01	− 689.12
Scientific	3.40E + 01	− 6.89E + 02
Currency	$34.01	($689.12)
, (Comma)	34.01	(689.12)
+/ −	•••••	•••••

(horizontal bar graph: asterisks indicate value is too large)

	+ + +	− − − − −

These cells display 3.45 and − 5.21.

Percent	3400.70%	− 68912.30%
Date-1	03-Feb-00	•••••
Date-2	03-Feb	•••••
Date-3	Feb-00	•••••

(In Date formats, the number indicates "serial number" of date [1 = 01-Jan-1900 to 73049 = 31-Dec-2099]. Asterisks show that negative numbers are meaningless as dates.)

Text	· 34.007	− 689.123

(Numbers are displayed in General format. Formula text appears instead of value.)

Notes:

1. Fixed, Scientific, Currency, ,(Comma), Percent formats: You may specify any number of decimal places between 0 and 15. The examples above all show 2 decimal places.

2. In General format, 1-2-3 automatically displays very large and very small numbers in scientific format.

Label Alignments

Labels are aligned according to their label-prefix characters. You cannot assign a label format to a cell itself, only to its label entry.

Label-Prefix	Alignment
' (apostrophe)	The ' prefix left-aligns.
" (double-quote)	The " prefix right-aligns.
^ (caret)	The ^ prefix centers.
\ (backslash)	+ − + − + − + − + − + − + −
	(entering \ + = creates a repeating label)

/Worksheet Global Label-Prefix: Sets global label-prefix, which 1-2-3 automatically adds to any label entered without a prefix.

/Range Label-Prefix: Changes the label-prefix for all labels in a range.

Long Labels: If a label is too long to fit in its cell, 1-2-3 left-aligns it and borrows space from empty cells to the right, in order to display as much of the label as possible.

Entry-Editing Keys

Value Mode and Label Mode

[Backspace]	Erase character preceding cursor
[Esc]	Erase entire entry
F2 [Edit]	Switch to Edit Mode
F9 [Calc]	Convert formula to its value
[Ctrl]-[Break]	Erase entire entry

Edit Mode

[Backspace]	Erase character preceding cursor
[Del]	Erase character at cursor
[Esc]	Erase entire entry
[Ctrl]-[Break]	Erase entire entry
F2 [Edit]	Return to Value or Label Mode
F9 [Calc]	Convert formula to its value
←	Move 1 character left
→	Move 1 character right
← or [Ctrl]-←	Move 5 characters left
→ or [Ctrl]-→	Move 5 character right
[Home]	Move to first character
[End]	Move to last character

Indicating Cell Ranges

1. Type addresses of two opposite corner cells.

D5..F48   H1.A17   J97...A1

(use one or more "." characters to separate addresses)

2. Expand the cell pointer to cover the range.

←	Move 1 cell left
→	Move 1 cell right
← or [Ctrl]-←	Move 1 page left
→ or [Ctrl]-→	Move 1 page right
[Home]	Move to upper left corner
[End] *arrow-key*	Move in indicated direction to boundary between empty block and non-empty block
[End] [Home]	Move to lower right corner of *active area*
F6 [Window]	(Split-screen only) Jump to current cell in other window
[Esc]	Unexpand pointer and return to *anchor cell*
[Backspace] .	Unexpand pointer and return to *current cell*
[Period]	*If not anchored:* Anchor pointer on the cell. *If anchored:* Shift *free cell* to next corner of range
[Ctrl]-[Break]	Cancel operation — return to Ready Mode

3. Use a range name that you have previously created.

● *In a formula:* Type a range name.

● *At a command prompt:* Type a range name or Press F3 [Name] to display a menu of all range names, then select one.

Range names up to 15 characters long (uppercase and lowercase letters equivalent) are created, altered, and deleted with the /Range Name command. Do not create range names that are the same as cell addresses (e.g. C47). Avoid using spaces and arithmetic operator characters in range names.